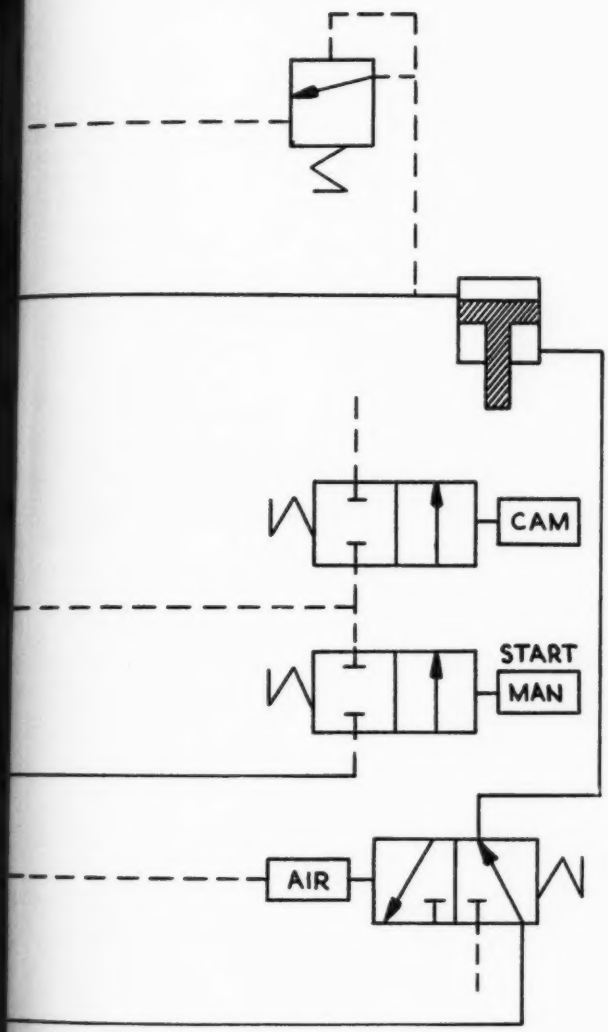
TOOLING & PRODUCTION
Magazine

JULY 1957



. . . a pneumatic circuit problem. Can you solve it and complete the diagram? — for details see SAFE PNEUMATIC CIRCUITS . . . page 80

IN THIS ISSUE

Talk of the Month — Designing for Easier Machining, Handling and Assembly . . . . . Kurt O. Tech 16

More Evaluation Contaminators in Foreman Selection . . . . . E. K. Taylor 48

Editorial — It's Time to Re-Evaluate . . . . W. N. Nordquist 69

Production Drilling and Reaming of Precision Holes . . . . . H. Gregg 71

Five Basic Rules in Chucking Work for Turning & Boring . . . . . E. C. Helmke 75

Safe Pneumatic Circuits . . . . W. E. Hoffman 80

Tool Post Grinder Applications 84

Complete Grinder Automation 85

Engineering Low-Quantity Cams . . . . E. C. Sassano 92

Flexible Coupling Compensates for Shaft Misalignment 106

Less Die Downtime with New Surface Grinder 117

DEPARTMENTS

Commendable Comments 32
Book Reviews 40
Manufacturing Memos 44
At Your Service 67
Coming Events 113
Shop Aids 134
Helpful Literature 136
Products on Parade 158
Cumulative Editorial Index 192

Choose with Care

PRESS DRAWING LUBRICANTS

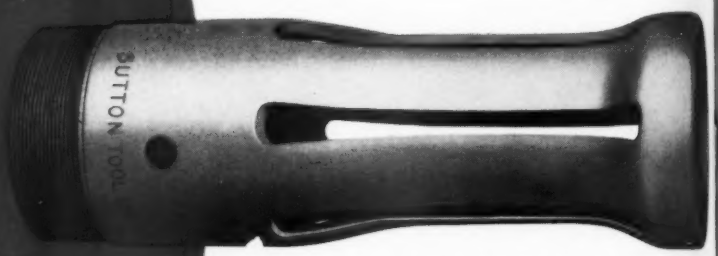
by Leon Salz
Manager, Lubricants Division
MAGNUS CHEMICAL CO., INC.

. . . page 87

3 best friends of an automatic bar machine

Style "L" Master Feeder—Interchangeable and replaceable pads seated in recess, with lug engaging a slot in the master to keep pads from rotating. No pins or screws. Style "L" handles stock practically up to machine capacity.

Super Cage-type Feeder — Advantageous for short runs. Tension easily adjusted simply by tapping with hammer, since multiple grips act as springs. Handles round, hexagon or square stock. Available in non-marring bronze.



Conventional Solid Feeder — Manufactured according to the dimensional specifications of Machine Tool Builders. Made from specially selected steels and given proper heat-treatment to provide better gripping and maximum tension for the life of the feeder.

These three feeders are the old reliables! 90% of all bar machine operations are performed with them! That's why it's important to use Sutton feeders. Sutton specializes in these three types—steel to exacting requirements, uniformity of tension, immediate deliveries from stock.

Sutton supplies a variety of feeders for specialized types of work; odd shapes for special extruded stock, combination feeders and feeder tubes for over-size stock. Call on Sutton for designing, engineering and manufacturing!

RUNS AS TRUE AS THE SPINDLE

Write For Free 28 Page Catalog

Sutton Tool Company

Dept. TP-7 Sturgis, Michigan

First COMPLETE LINE OF STANDARD END MILLS for ALUMINUM

For further information on Putnam End Mills for Aluminum, write for Catalog 457.

Again PUTNAM LEADS . . .

Standard End Mills . . . For the first time you can select from a complete line of **standard** end mills designed specifically for milling aluminum . . . Putnam stocks 185 **standard** types and sizes.

New Designs . . . These **standard** end mills have been developed through years of research and experience on aluminum applications. Over a year ago, Putnam introduced the first **standard** end mills designed for milling of aluminum. Today, no other manufacturer offers as complete a line of **standard** end mills for aluminum.

Contact your Putnam Distributor for personalized service, quick delivery of the finest standard end mills for aluminum.

6053

PTCo PUTNAM TOOL COMPANY

2981 CHARLEVOIX AVENUE · DETROIT 7, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 3

CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

JULY 1957
VOL. XXIII—No. 4
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T&P Reader:

There is one aspect of the publishing business, knowledge of which can appreciably benefit you. In an earlier issue this year, in this column, we discussed the subject of serendipity, which, as you know, is a dividend of information while looking for something else. Please let your thinking stray from normal pursuits for a few minutes, and read on —

You are frequently asked for information, ideas and opinions by ours and other publishing organizations. We're mighty grateful to you for very considerate and willing response to our queries and we want to make it known right now that we thank you very much. Sometimes you may wonder if this or that query that you get is really necessary. I suppose there occasionally may be one that you think might have been dispensed with, but actually, every single one you answer means something to you.

Our editors have to know what you're thinking about the written material we provide for you. They need to know whether it is useful, so your comments to them are invaluable guidance in providing reading matter that has real value to you.

Our circulation people who are charged with the responsibility of getting our magazine into the hands of men who will be benefited by it, need periodic assistance from you and get it. It is our responsibility to see that our advertisers get real value. Value for them lies in the magazine reaching and being read by men who are concerned with the value of advertisers' products in manufacturing operations. So, when you give us information about yourself, your responsibilities and your plant, you are helping us to tailor the magazine to your needs and likewise to the needs of our advertisers. So, we thank you very much for your responses to requests for this kind of information. In case there is any doubt as to how it is used, you can be completely sure that what you tell us is completely confidential. The information you give us is never known beyond our own offices except when it is unidentifiable as a tiny fraction of a composite.

Thanks again for your very good help. We won't bother you any more than absolutely necessary and we will keenly appreciate your responses to all of our queries to you the first time they are received. This will save you the nuisance of handling them more than once, also.

Cordially yours,

Ray Huebner

Publisher

TOOLING & PRODUCTION

READERSHIP RESEARCH — BPA

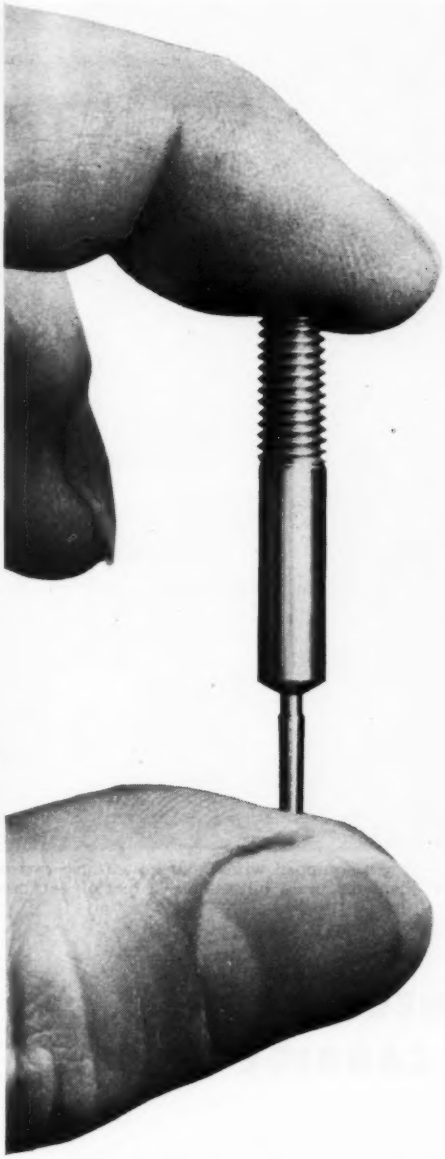
Editorial Staff
E. Willard Pennington, Editor
Watson N. Nordquist, Managing Editor
Carl F. Benner, Associate Editor
William E. Hoffman, Associate Editor
Carol E. Reuss, Associate Editor
Joanne Frolo, Assistant Editor
Ernest J. Urbas, Contributing Editor

Business Staff:
R. L. Huebner, Publisher
C. A. Hurt, Assistant Publisher
P. E. Hager, Production Manager
E. J. Brooks, Art Director
B. C. Jackson, Research Manager
E. N. DeCaprio, Contract Manager

Editorial and Business Offices: 1975 Lee Road, Cleveland 18, Ohio, FAirmount 1-4040
Printing Office: 112 E. Chestnut Street, Louisville 2, Ky. (For Plate Shipments Only)

Published Monthly by HUEBNER PUBLICATIONS, INC.
R. R. HUEBNER.....Chairman, Secretary, Treasurer
RAY L. HUEBNER.....President GEORGE J. HUEBNER, JR.....Vice President

Copyright 1957. Published monthly by Huebner Publications, Inc. Accepted as Controlled Circulation Publication at Louisville, Ky. Single copies, $1.00 each. U. S. subscription rate, $2.00 per year for metalworking plant operating executives and department heads. All other U. S. subscriptions $6.50 per year. All foreign subscriptions, $10.00 per year.



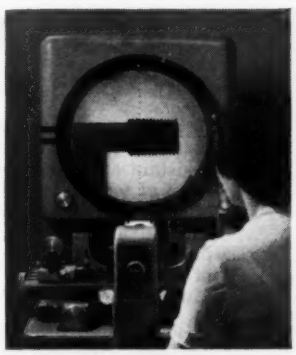
How Minneapolis-Honeywell holds tapers to a tolerance of ± 2′ ...at a glance

Small tapered needle valves at Honeywell's Brown Instruments Division are tough to gage quickly and accurately. Read how optical gaging makes the job easy.

This tapered needle valve is used to reset a pneumatic process control system. Typical dimensions are 1 19/32″ overall with critical taper section less than ½″ long. The actual taper is 2°14′, plus or minus 2′. Since the valve only moves .030″ in regulating flow, accuracy is critical if the flow rate is to be precisely controlled.

This is the sort of measuring job optical gaging thrives on. At Brown Instruments Division of Minneapolis-Honeywell Regulator Company they use a Kodak Contour Projector to check these pieces at the rate of one every 2½ minutes, picking up not only taper but eight other dimensions and concentricity. With optical gaging they find accuracy is greater, since "feel" is eliminated. Production personnel can *see* any variation from tolerance—there's no disagreement between the manufacturing and inspection. And gage wear has been eliminated as a factor in reducing accuracy.

Got a tough-to-measure part like this? Is gaging taking too long or tieing up too many highly trained men? Is inspection holding up production? Optical gaging on a Kodak Contour Projector may be the answer. To find out more about how it can work for you, send for the booklet "Projection Gaging with Kodak Contour Projectors."



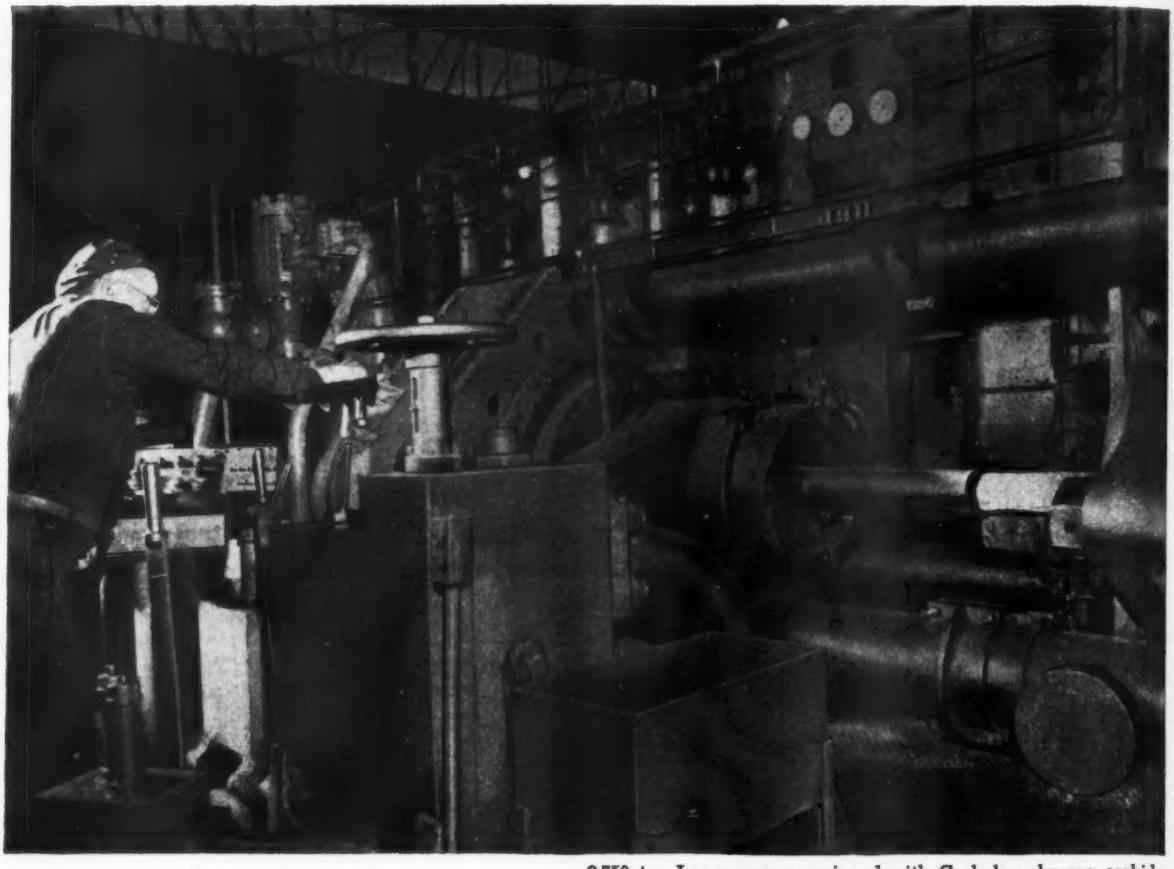
A single Contour Projector checks a wide variety of parts simply by changing charts and fixtures.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.
Apparatus and Optical Division

the KODAK CONTOUR PROJECTOR

Kodak

CIRCLE INFORM-A-GRAM KEY NO. 5



2,750-ton Loewy press equipped with Carboloy chrome carbide dies reduces 8"-diameter brass billets to 400 feet of .441" rod.

Press downtime reduced 80%...

HOT-EXTRUSION BOTTLENECK BROKEN BY CARBOLOY® CHROME CARBIDE DIES

Carboloy cemented chrome carbide is harder than the hardest die steel. It is far more wear resistant and has excellent oxidation resistance, even at temperatures up to 1,800° F. These and other unique physical properties made chrome carbide an ideal die material for solving the production problem, caused by rapid wearing of steel dies used to hot-extrude brass rod, at Mueller Brass Co., Port Huron, Michigan.

Before switching to chrome carbide, unpredictable product size and varying hardness made it necessary to change steel dies frequently. Downtime bottlenecked production rates, and prevented Mueller from getting maximum efficiency from their automated line.

Today, one Carboloy chrome carbide die does the work of 20 steel dies in extruding .441"-diameter free-machining brass rod. Tolerances are constantly held to ±.006". Production is at a new high, and downtime has been cut 80%.

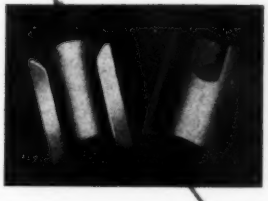
Carboloy *chrome* carbide may be the economical solution to your hot-extrusion problem. Carboloy *tungsten* carbides may bring similar benefits to your other die operations . . . whether you're cold-extruding, drawing, forming, or blanking. Ask your diemaker about them. Or for more information, and technical assistance, write: *Metallurgical Products Department of General Electric Company, 11111 E. 8 Mile Road, Detroit 32, Michigan.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

CIRCLE INFORM-A-GRAM KEY NO. 6

SCREW MACHINE OPERATORS

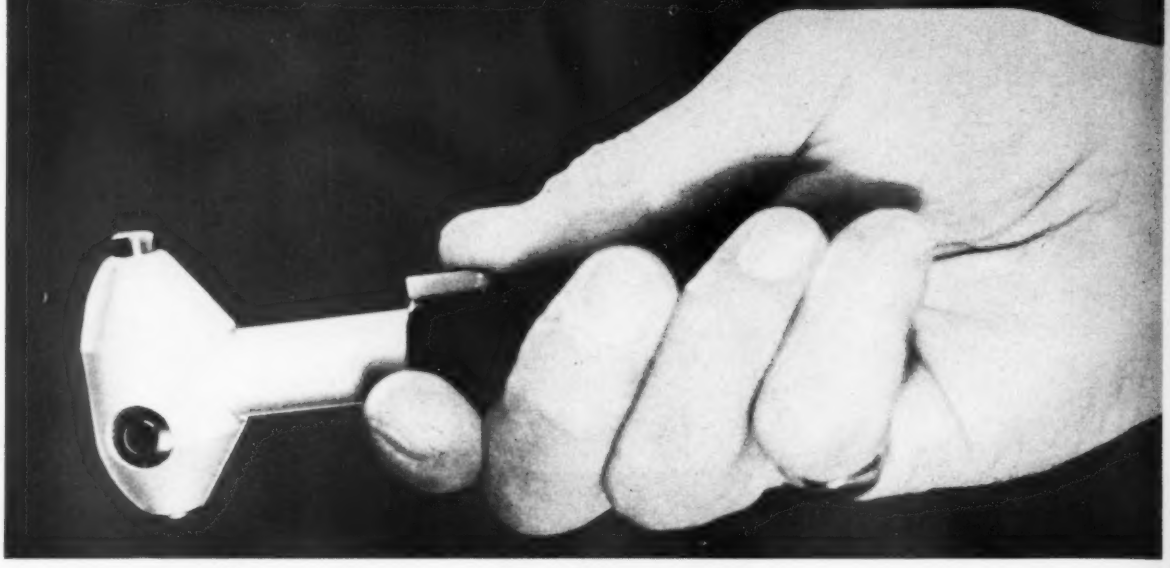


● To avoid galling and scratching caused by ordinary pusher pads, get the pusher pad that works "like magic"... practically wear proof and relatively inexpensive ... Balas Solid Carbide Pusher Pads for Model "A" Master Pushers! Investigate their exclusive advantages by writing for literature and prices today!

BALAS **COLLET MANUFACTURING CO.** / **CLEVELAND 14, OHIO**

CIRCLE INFORM-A-GRAM KEY NO. 7

MEASURE INTERNAL DIAMETERS QUICKLY AND ACCURATELY WITH OPTO-MIKE



simply.....

INSERT **SWEEP, REMOVE AND READ**

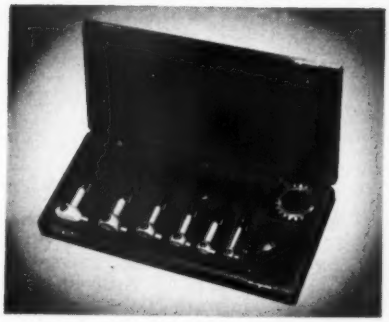
and you have an accurate and precise measurement.

New developments in optics have been combined with the accepted best principles of measurement to produce **OPTO-MIKE**, a visual internal diameter gauge.

The **OPTO-MIKE** finds special value for determining elliptical or "out of round" condition. Based on the two-point measuring principle, the **OPTO-MIKE** can make two readings at right angles to one another, thus providing a precise measurement of "out of round."

OPTO-MIKE is now in daily use in many of America's largest industrial companies where **QUALITY CONTROL** is paramount. It has won approval and acceptance by Government Agencies.

Whenever bore dimensions must be checked, **OPTO-MIKE** is indispensable.



The OPTO-MIKE is available in matched sets for internal measurement from .800" to 6.000".

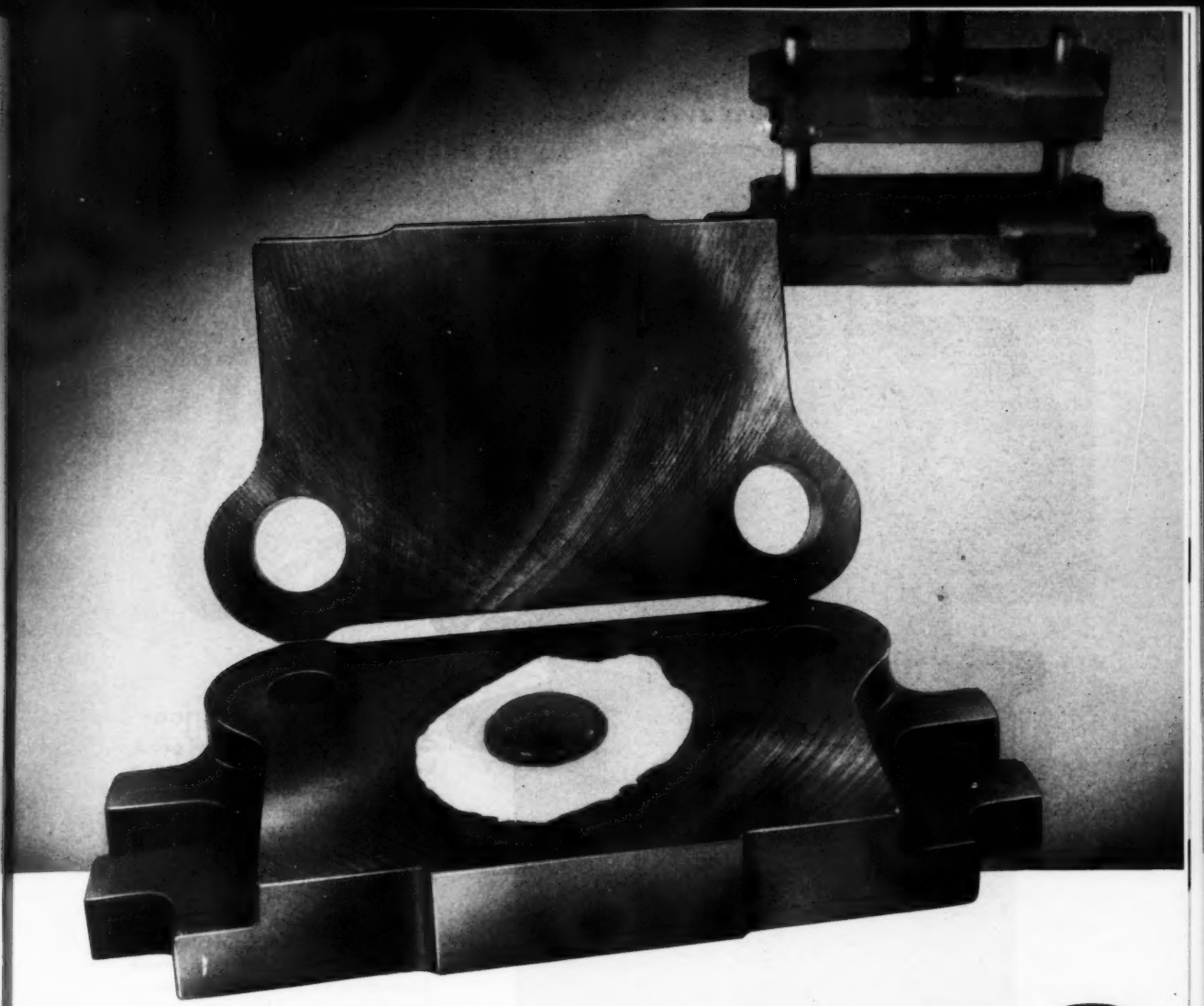
OPTO-MIKE

WRITE:

AMERICAN GAUGE CORPORATION

480 BLOOMFIELD AVENUE VERONA, NEW JERSEY

CIRCLE INFORM-A-GRAM KEY NO. 8



WHAT'S COOKING ON DIE SETS?

The egg you've laid, brother, if the job isn't right.

Whether you're the tool engineer or the diemaker, once the die's in the line it has to produce or you've had it. And today it has to produce hundreds of thousands, even millions, of parts to pay for itself.

Obviously the die set is no place to cut corners. It's not only the heart of the die but frequently it's the least expensive part of the die anyway. A few dollars saved here won't go very far spread out over the life of the die, and it can prove costly.

Making quality die sets is our business. Quality means precision and stamina:

Precision for fast, accurate diemaking and lasting production accuracy.

Stamina to assure long, trouble-free operation in the line.

For your convenience, Detroit Die Set stocks over 2000 standard die sets. Our new catalog covers them all, plus details on specials, too. Ask for your copy on your company letterhead today.

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Detroit
DIE SET
CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 9

ALL THE **PRODUCTION** YOU'LL *EVER* WANT—

ALL THE **PRECISION** YOU'LL *EVER* NEED

RIGIDITY and STAMINA TOO!

Generates spur gears, spiral gears, bevel gears, face gears, worm gears, worms, spline shafts, gear sectors and pinions. 12 hob speeds, from 109 to 1259 R.P.M. Helix leads from .800" to 130". Generates gears with as few as 3, or as many as 650 teeth. Speed, feed, and indexing, each can be selected independently. Capacity from .050" to 6" O.D. of gear blank depending on gear characteristics. Free Bulletin No. 2544 provides full information.

2544

It's the

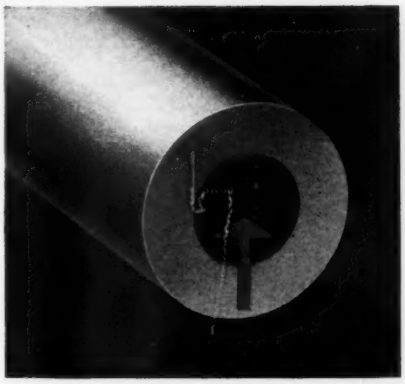
Hamilton

PRECISION SMALL-GEAR HOBBING MACHINE

THE HAMILTON TOOL COMPANY • 832 SOUTH NINTH STREET • HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 10

a hole here makes waste...



a hole here saves waste

Crucible Hollow Tool Steel cut sections eliminate the waste and cost of drilling out solid rounds to make ring-shaped or tubular steel parts, or tools with a center hole. By using these hollow bar sections, cut to length, you do away with unnecessary cutting, drilling, and boring operations, increase machine capacity, and cut scrap losses.

These hollow sections, in just about any O.D. and I.D. combination, or thickness you want, are *immediately* available in five most popular Crucible grades: KETOS oil hardening, SANDERSON water hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air hardening, and NU DIE V hot-work tool steels.

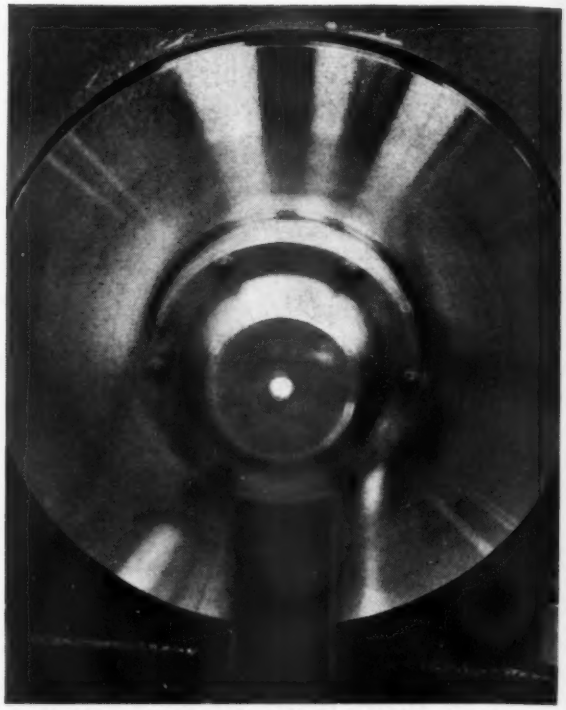
Call your nearby Crucible warehouse for more information, or for speedy delivery. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 11



Self-locking UNBRAKO socket screws keep critical adjustments secure in the eccentric drive mechanism of this fatigue testing machine. Drive system delivers varying loads up to 15,000 pounds force to equipment under test at 1050 cycles per minute.

Vibration won't loosen Self-locking UNBRAKO socket cap screws

Screws with Nylok* device permit adjustments, keep precise settings during long test runs

HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together, and locks the screw securely—whether or not the screw is seated.

UNBRAKO socket screws with the Nylok self-locking device stay tight under constant vibration.

Take the eccentric drive system in the fatigue testing machine illustrated above, for example. This machine must frequently run for periods up to 2 weeks or longer, day and night, to complete a single test. Loosening of the screws which are used to adjust the tension-setting mechanism could not only cause damage to the machine, but also make the test data worthless. Self-locking UNBRAKO socket head cap screws eliminate such problems.

An UNBRAKO socket screw with the Nylok self-locking device is a single unit. Just screw it into any tapped hole. Seated or not, it locks positively wherever wrenching stops. Constant vibration or pounding, or endless running of a machine, won't affect these self-locking UNBRAKOS. The screws will not work loose!

Write today for your copy of Form 2193, which gives complete catalog and technical data on the entire line of UNBRAKO socket screws with the Nylok self-locking device. Or see your authorized industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

UNBRAKO® SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

*T.M. Reg. U.S. Pat. Off. The Nylok Corporation

CIRCLE INFORM-A-GRAM KEY NO. 12

SUPERFINISH BORES REDUCE TOOL WEAR
KNURLED HEADS PROVIDE GOOD GRIP
UNIVERSAL DRILL BUSHINGS
industry's standard of quality and service
100% CONCENTRICITY AND HARDNESS TESTS INSURE ACCURACY
BLENDED RADIUS HELPS PREVENT TOOL HANG-UP
Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Vastly increased production facilities assure immediate deliveries. Write to the office nearest you, Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH MICHIGAN
U
Universal products include:
Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, and Universal Index Plungers. Write for catalog.
189
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 13

They made 1 wheel

Working closely with foreman Bill Todd (right) of Whitin Machine Works, Whitinsville, Mass., and with Bay State's sales engineering department, distributor Vic Ericson, of Johnson deVou, Worcester, Mass., has helped cut Whitin's grinding costs thousands of dollars a year.

do the work of 12

This is the story of two stubborn men and what seemed to be an impractical idea. The idea still seems pretty amazing to many experienced grinding men . . . but time and cost sheets over a four year period *prove* that it works.

Here's the story.

The central grinding department at Whitin Machine Works has all the problems of job-shop operation. Their centerless grinders, for example, are used to finish parts that range from 1 8" to a full 5" diameter and come in bronze, brass, aluminum, cast iron, Meehanite and all types of soft and hardened steel. Runs are short; as low as three or four pieces and rarely over a couple of hundred.

To handle this tremendous variety of jobs, the shop had stocked a dozen different types of grinding wheels and foreman Bill Todd wanted to simplify. He wanted to cut the amount of valuable labor and machine time that went into wheel changes and put it into production. And, what he really hoped to get was not just a few multi-purpose wheels but *one all-purpose* wheel.

Successful in convincing Whitin's tool control engineer that it was worth the try, he called in Bay State distributor Vic Ericson. Ericson accepted the challenge and went to work with Bay State's sales engineering department. The effort paid off.

The result was a single wheel that handles all the sizes and all the metals. On regular work, finishes average around #16RMS and Bill Todd's skilled operators can get as fine as #2; a single dressing once an hour maintains normal high production rates.

Whatever your company's abrasive problems may be, you'll find Bay State representatives ready to help and competent to work out practical solutions.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.
Distributors: All principal cities. Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario.

CIRCLE INFORM-A-GRAM KEY NO. 15

Lepel
HIGH FREQUENCY *Induction* HEATING UNITS

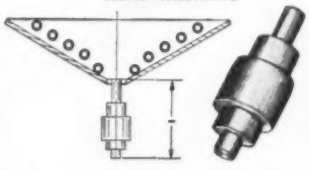
BRAZING HARDENING BOMBARDING SOLDERING ANNEALING MELTING

The Lepel line of induction heating equipment represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating.

If you are interested in induction heating you are invited to send samples of the work with specifications. Our engineers will process and return the completed job with full data and recommendations without any cost or obligations.

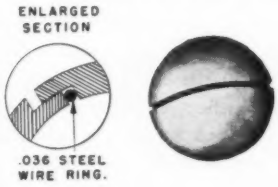
TYPICAL INDUCTION HEATING APPLICATIONS

TEMPERING FOR CUSTOM HEAT TREATING



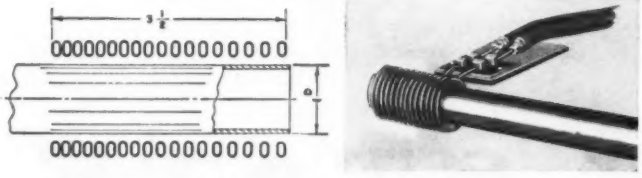
Selected areas of hardened steel parts may be tempered for fabrication or service requirements. Concentrator type coil permits high power density in restricted area thus minimizing heating time and permitting marked variation in properties in adjacent sections.

WIRE RING JOINS PLASTIC PARTS



High frequency induction heats wire ring which in turn heats plastic wall, providing sufficient plasticity to cause flow and bonding upon application of pressure. Metal to plastic seals are similarly performed.

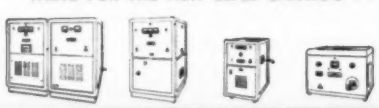
ANNEALING ALUMINUM FURNITURE TUBING



Selective annealing of aluminum furniture tubing permits bending where required without loss of strength in adjacent portions of tube. Brass or steel tubing is also being selectively annealed.

Electronic Tube Generators from 1 kw to 100 kw.
Spark Gap Converters from 2 kw to 30 kw.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.



All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 16

Talk of the Month

DESIGNING FOR EASIER MACHINING, HANDLING, AND ASSEMBLY

by Kurt O. Tech
Vice President, Engineering
THE CROSS COMPANY
Detroit, Michigan

IN RECENT YEARS CONSIDERABLE PROGRESS has been made in the ever increasing mechanization of productive processes in the manufacturing industries. This progress has been so rapid that a new word has been coined to describe it. It is called, "Automation."

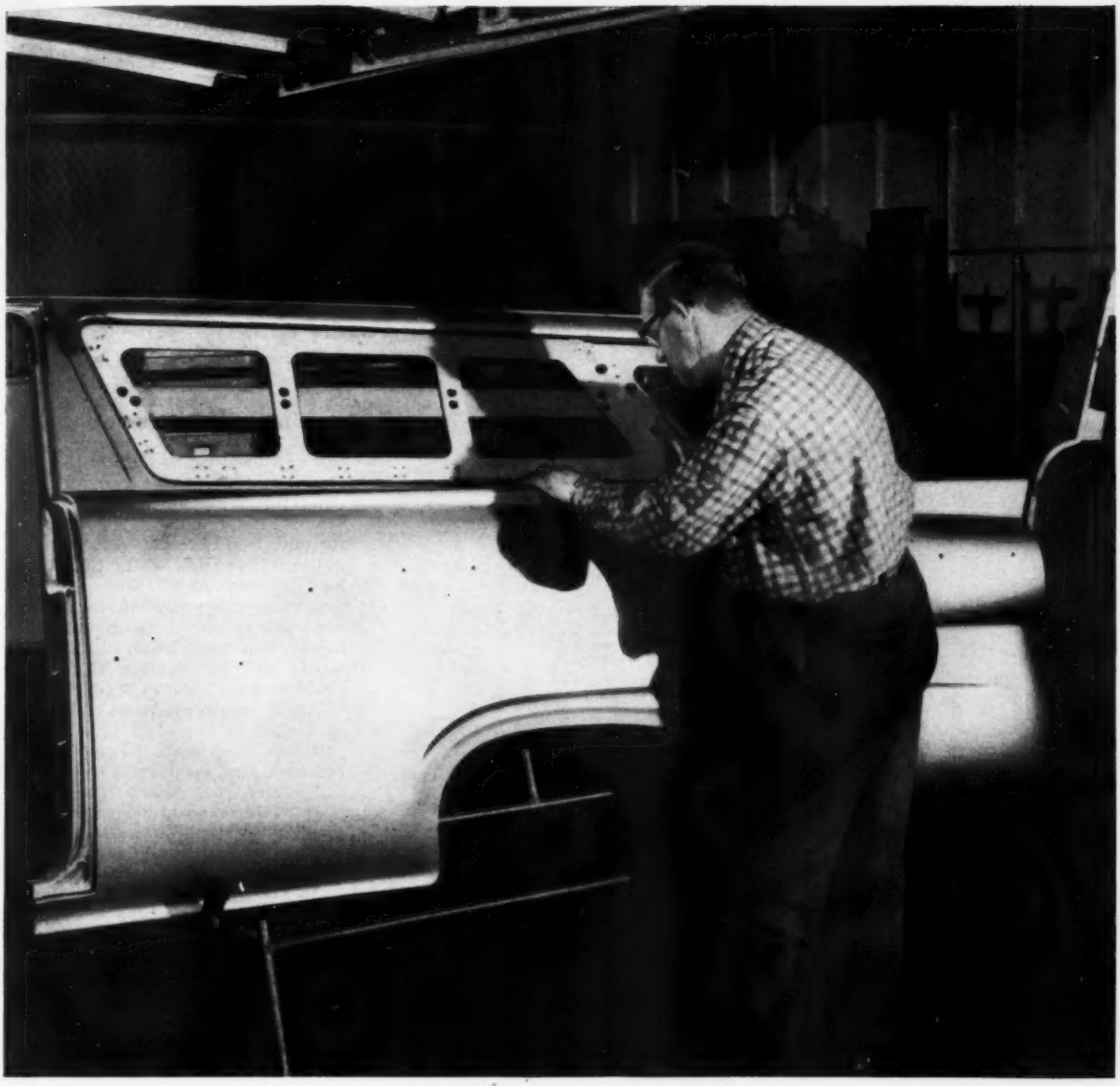
Analysis shows that most of this progress has come about through the mechanization of material handling between machining, cleaning, gaging, and assembly operations. When we consider the costs of moving parts around a manufacturing plant, it becomes quite clear that here a fertile field exists for the reduction of overall production costs. It was recently estimated in one of our large electrical manufacturing concerns that material handling is responsible for about 25% of the total cost of the product, and almost 40% of the total labor cost.

The primary contribution of companies such as The Cross Company has been in developing means to integrate machining and assembly operations with the material handling equipment required, so as to provide automatic processing.

As we progress in this field there are two general areas of limitation which must be continually overcome. The first involves our own experience and the limits of our own technology. The second involves the limitations imposed by the design of the product being processed.

Product designers generally are well aware of the effects which the design of a component can have on the cost because of the machining operations required. They know, I am

Abstracted from a talk by Mr. Tech at the recent Design Engineering Conference.



Lightweight magnesium fixture checks Ford station wagons

This magnesium checking fixture is used by Ford Motor Company in assembling Ford two-door station wagons.

It helps to maintain quality by checking the daylight opening relationship to the glass run channel and regulator retainer brackets in the quarter panel welded assembly. It assures accurate location of the glass run retainers and window regulator mounting holes. The fixture is dimensionally stable and has stood up well under continuous rough handling. One man can easily lift and manipulate it with one hand.

Jigs and fixtures made with magnesium are always easy to handle because they weigh much less than steel or aluminum. Magnesium tooling plate is uniformly flat, low in cost and easy to machine, fabricate and weld.

For the full story on magnesium tooling plate contact your nearest supplier of Dow magnesium or write to us.

THE DOW CHEMICAL COMPANY, Midland, Michigan, Department MA 1416W-1.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Michigan • Fullerton Steel and Wire Co., Chicago, Ill. Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Co., Los Angeles, Calif. Vinson Steel and Aluminum Co., Dallas, Texas.

YOU CAN DEPEND ON DOW

CIRCLE INFORM-A-GRAM KEY NO. 17

sure, that surfaces which must be contour machined, rather than machined as planes, increase the cost. They are aware of the fact that angular holes, whether they be drilled, tapped or bored, are more expensive than horizontal or vertical holes. . . . that the greater number of different angles of holes which exist on a part increase the number of machining stations and the cost of capital equipment is also well known. Closer tolerances, I am sure, mean higher cost to most designers.

Our experiences with our customers' product designers indicate that they are coming more and more to appreciate the need for proper locating and clamping points because it assures them of a much better chance of having the part machined to drawing specifications.

DESIGN FOR HANDLING

Not nearly as well known or understood is the effect which the design of a part can have on costs through the handling, storing, and assembling of such parts. Many times insufficient consideration given to these problems in product design results in excessive costs in their manufacture. While much of our thinking at the present time regarding such designs is in the field of mass production, I believe that in the future such thinking will also have to be applied to the lower production industries.

For the machining of parts in automation type machine tools, it is necessary that provisions be included on the part, either as a part of its functional design or as an addition, to permit its being carried through a series of machining operations easily. This normally involves means of guiding and supporting the part between operations and means for locating it accurately during successive machining operations.

If they are not provided on the part, and at times they are impossible to provide, it becomes necessary for us to locate and clamp the part on a pallet which does provide such guiding and locating means. This pallet then carries the part through the machine for its various machining operations. After being unloaded at the far end, it is necessary to return the pallet to the front of the machine to load another part. This adds considerably to the capital cost because the pallets and the pallet-return mechanism are equipment which would not be required if the part could be guided through the machine by itself and located and clamped in each station.

Design for easier handling often presents the product designer real difficulties, but many times very slight differences in design can mean large differences in outlay for the capital equipment necessary to machine the parts.

As an illustration, let us compare two crankshaft bearing cap assemblies. Each of the assemblies carries all of the bearing caps for one engine in one casting. It is normal in the automotive field to do all of the machining operations with the caps connected, then saw them into five separate pieces as a final operation.

Parts of this type are usually made on a machine in which it is necessary to move these bearing cap assemblies between machining stations. The best way to do this is to slide the part along on guide rails.

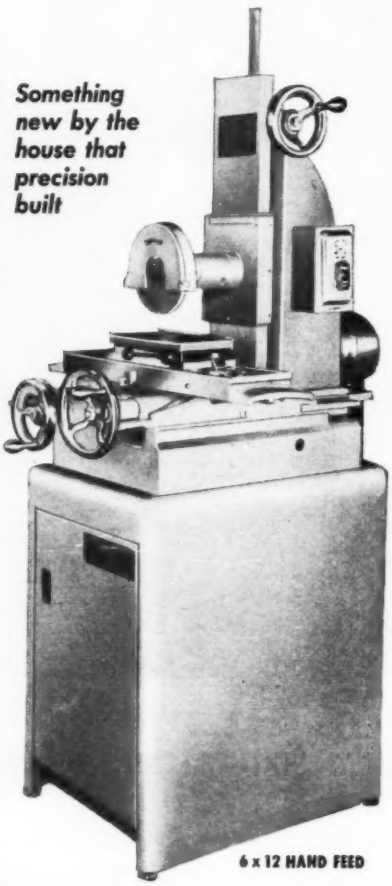
Bearing cap assembly "A" is basically a square block of cast iron with a single protrusion along the center of one side of the four intermediate caps. This protrusion contacts one of the three guide rails and permits very easy handling of the part.

Bearing cap assembly "B" has a large circular head on the main bearing cap. Because of this, it was impossible when designing a machine to provide a simple guide. The result was a considerably more complex transfer mechanism, involving a motion transverse to the direction of transfer, to support the part during its transfer. Naturally, since it was a more complex mechanism, it

. . . Continued on Page 22

TML BY Harig

Something new by the house that precision built



6 x 12 HAND FEED

6"x12" precision surface grinder

The new TML by Harig provides extremely fast and accurate grinding, with a new operational ease never before known. 100% more longitudinal travel than before with each rotation of the wheel. You get smooth surfaces in minimum time. Economical—low maintenance.

SPECIFICATIONS

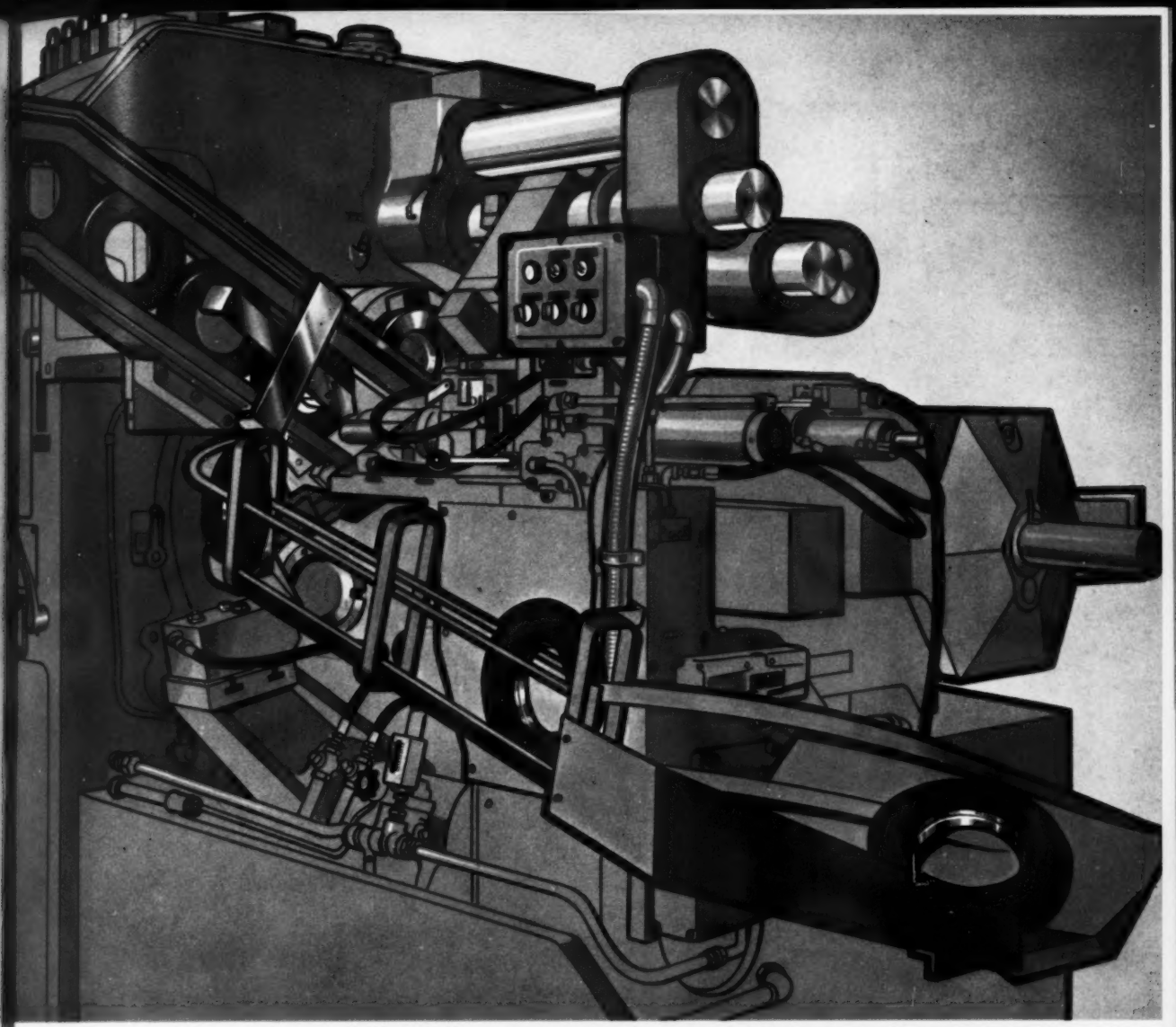
Longitudinal travel ..... 12⅜"
Transverse travel ..... 7"
Vertical travel ..... 12¾"
Working surface of platen ..... 12" x 6" ½" T slot
Grinding wheel ..... 7" dia. x ½" face
Grinds 12¾" over platen with 7" wheel
Standard spindle speed 3000 R.P.M.
½ or ¾ H.P. motor—Net wt. with motor 575 lbs.
Can be used with or without floor stand.

Harig Manufacturing Corp
5761 W. HOWARD ST. • CHICAGO 31

SEND ME LATEST BULLETIN ON THE NEW TML GRINDER BY HARIG

Name_____ Title_____
Company_____
Address_____
City and State_____

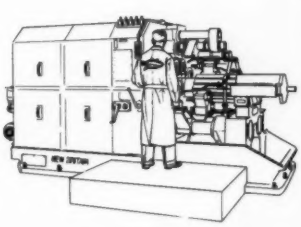
CIRCLE INFORM-A-GRAM KEY NO. 18



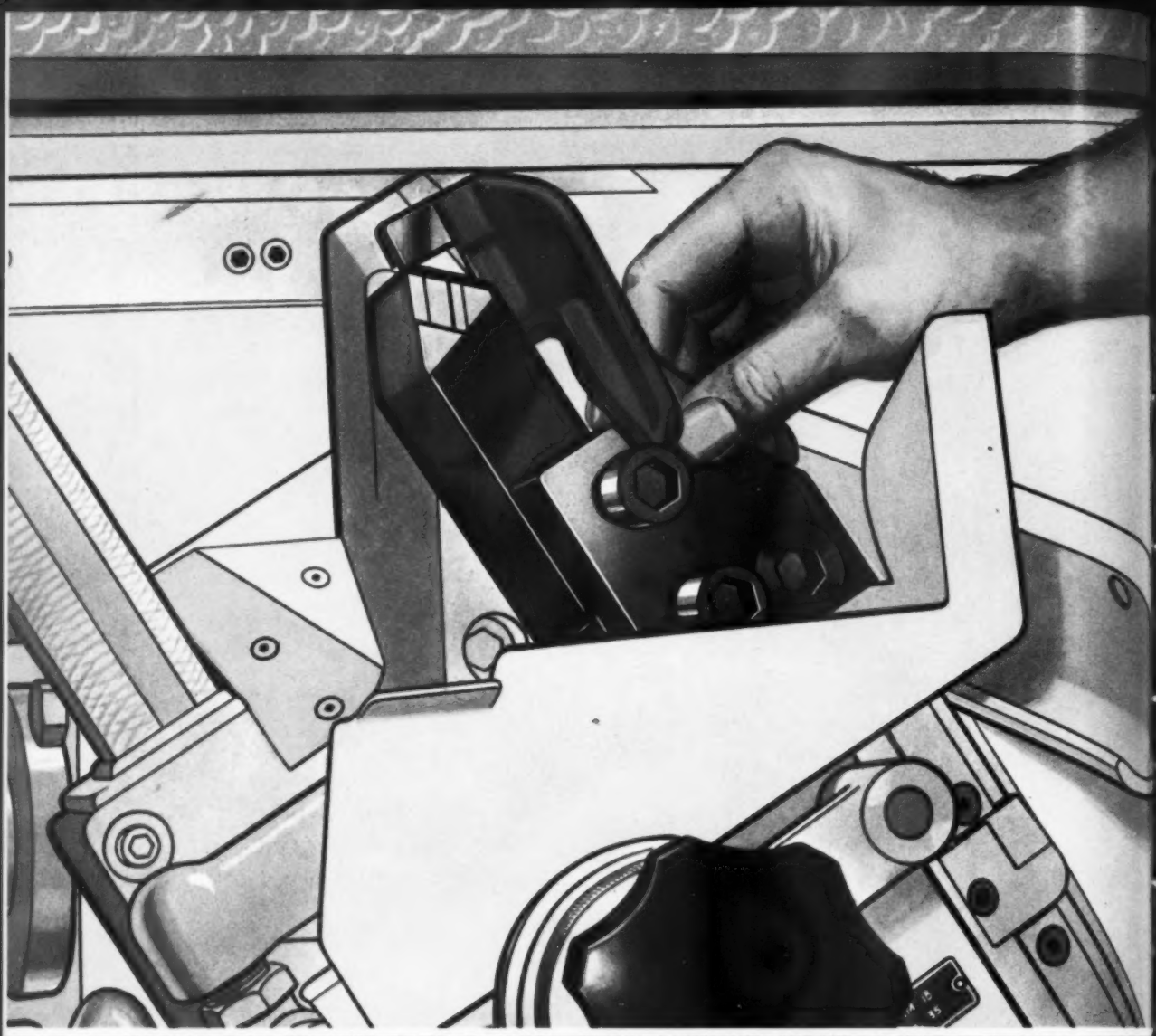
get more chucker work done

with automatic "handling"

New Britain chuckers are the time-tested leaders in their field. Their basic open-end design, an exclusive New Britain feature, makes them unusually well adapted to the automatic handling of pieces. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



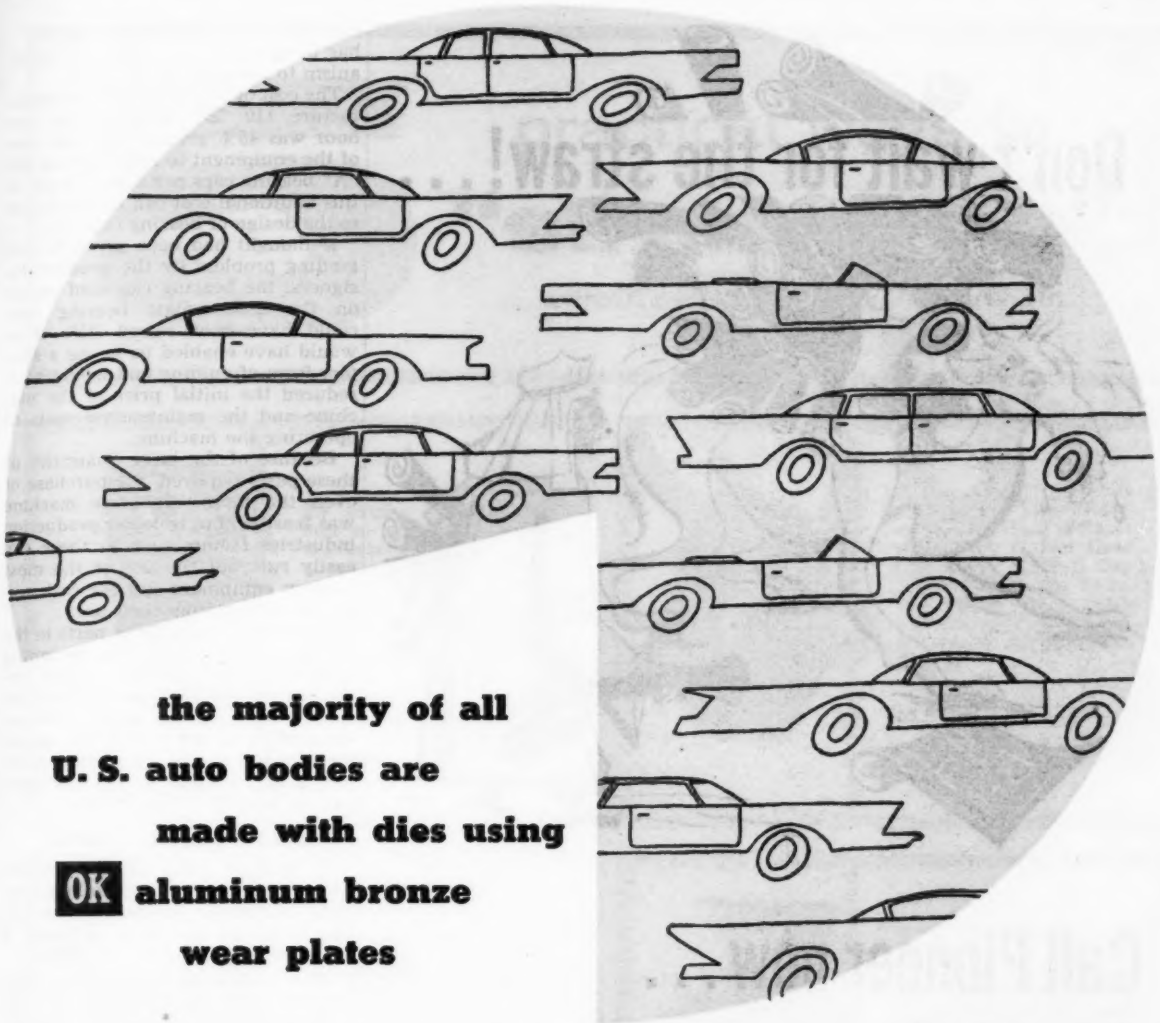
Automatic Chucking Machine



1-minute tool change gets more contour work done

It's a fact — you can do more work in a day with a New Britain +GF+ copying lathe and a single-point tool, than with a conventional lathe using half a dozen. Just slip out the worn tool, slip in a new one, gauge it to a single dimension and you're ready to go again. The template repeats the dimensions. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

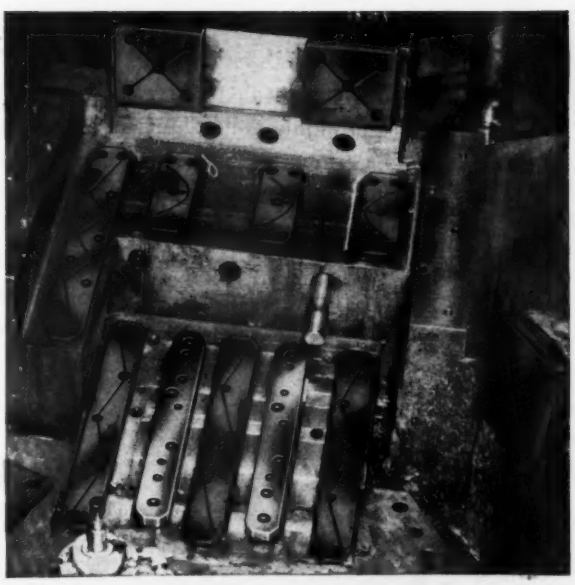
New Britain +GF+ Copying Lathe



the majority of all U. S. auto bodies are made with dies using OK aluminum bronze wear plates

Here's why: You can save approximately 40% under the cost of expensive solid bronze wear plates . . . and you receive completely finished wear plates, available from stock, ground to ± .0005 parallel and flat. By a unique cladding process, long wearing aluminum bronze is bonded to a steel base, easily machinable for fitting to dies. Drilling or counterboring can be done through bronze surface if required. Wherever your die has a sliding or cam action, OK aluminum bronze wear plates, because of their great wearing qualities, assure longer die life.

Photo at right shows OK aluminum bronze wear plates in a body die at one of the world's largest automotive plants. Complete information is in our new OK Catalog. For your free copy, write Dept. 5S-LL.



THE OHIO KNIFE CO.
CINCINNATI 23, OHIO

SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS • WORK-REST BLADES • CUT-OFF BLADES • SCRAP CHOPPERS • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

CIRCLE INFORM-A-GRAM KEY NO. 21

Don't wait for the straw!...

Call Pioneer now...

Why worry about where to find competent designers and engineers of dies, fixtures, tools and gages.

Pioneer has them for you.

Our highly skilled tool designers and engineers are the permanent solution to engineering overloads in many tool and process engineering departments like your own.

They will be ready to go to work *when and as you need them.* Eliminate worry about temporary overloads and excessive payrolls. Call Pioneer headquarters now.

SINCE 1931 **Pioneer ENGINEERING & MANUFACTURING CO., INC.**
Telephone - TWinbrook 3-4500
19669 John R Street, Detroit 3, Michigan

INDUSTRIAL ENGINEERS, CONSULTANTS & DESIGNERS
BRANCH OFFICES IN DAYTON, OHIO, WASHINGTON, D. C. and TORONTO, ONT., CAN.

CIRCLE INFORM-A-GRAM KEY NO. 22

. . . Talk of the Month from page 18

has been a more troublesome mechanism to maintain in the field.

The cost of the equipment to manufacture 110 "B"" bearing caps per hour was 45% greater than the cost of the equipment to manufacture 180 "A" bearing caps per hour. Much of this additional cost can be attributed to the design of bearing cap "B".

If thought had been given to this guiding problem by the product designers, the bearing cap stud bosses on the intermediate bearing caps could have been raised .25". This would have enabled us to use a simpler form of guiding and would have reduced the initial price of the machine and the maintenance costs of operating the machine.

Because of the large quantities of these parts required, the purchase of even the more expensive machine was feasible, but in lower production industries factors such as these can easily rule out the use of the most modern equipment and the cost savings resulting from their use.

Automatic assembly of parts in the manufacturing field is becoming more and more common. Here too, the design of the various components to be assembled can have a tremendous effect on the cost of the equipment required and frequently in determining whether or not the parts can be assembled automatically.

AUTOMATIC ASSEMBLY FACTS

To outline some of the requirements of product design to help simplify automatic assembly, I would like to review the steps involved in an automatic assembly machine.

1. The basic major part of the complete assembly, such as the cylinder block in an internal combustion engine, or the compressor case in a compressor, must be carried through the machine.
2. This basic part must be accurately located at various assembly stations so that the components to be assembled to it can be brought into proper position.
3. These components to be assembled to the basic part must be properly oriented in the machine.
4. They must be distributed to the required point on the machine for assembly with the basic part.
5. They must be positioned accurately relative to the basic part while being assembled.

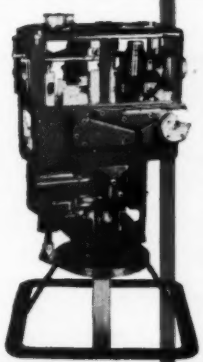
PRODUCT REQUIREMENTS

Along with the five steps just outlined, there are five product requirements which will make automatic assembly considerably easier:

1. The basic part must have proper guiding surfaces accurate enough so that the part can be moved through the assembly machine without the use of complex transfer mechanisms.
2. The part must have accurate locating holes or surfaces so that it

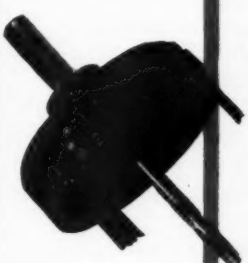
5 practical ways to "streamline"

...without sacrificing fastening strength

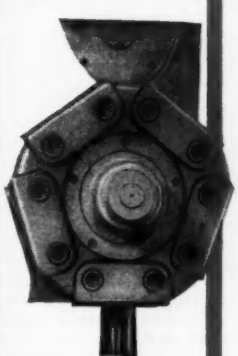


1. Counterbored holes are the simplest approach to flush surfaces using standard socket cap screws. The advantage of specifying genuine Allen O Head Cap Screws is the greater strength of Allenoy steel... you can use smaller sizes for closer spacing and reduced weight. Call on Allen, too, for *very large* socket-head, precision cap screws — up to 2½ inch diameter.

2. Countersinking enables you to get absolutely smooth external surfaces using Allen O Flat Head Cap Screws. Allen O Cap Screws feature the exclusive Leader Point which makes screw starting easier and guards against thread damage.



3. Button Head Cap Screws produce snag-free unbroken surfaces where countersinking is impractical. Button-head hex sockets are necessarily shallow. In genuine Allen O Button-Head Cap Screws, sockets are cold forged without broaching, in extra strength Allenoy steel... essential protection against stripping the sockets under high torque pressure.



4. A ready made hole tapped in forged steel solves many a design problem. It's called the Allenut. It can be anchored in soft material to assure durable threading, or recessed to permit tightening with an Allen Hex Key.

5. Bright finish, or rust and corrosion resistance call for Allen O Stainless Steel Cap Screws. They are standard stocked items (both NF & NC threads) readily available in a wide range of sizes from Allen Distributors.

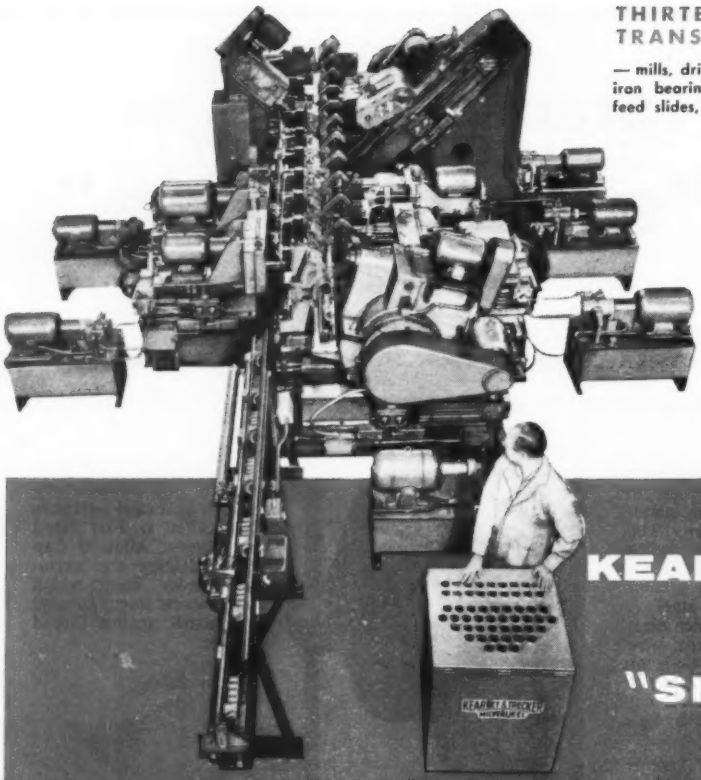
YOUR ALLEN DISTRIBUTOR can give you practical help and swift service. For complete information on any technical fastening problem, write our engineering department direct.

ALLEN HEAD

ALLEN

[redacted]
Hartford 2, Connecticut, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 23

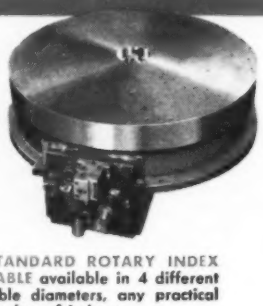


THIRTEEN STATION AUTOMATIC TRANSFER MACHINE

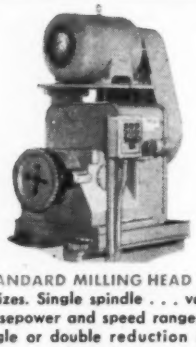
— mills, drills, reams, spotfaces, taps and saws apart cast iron bearing cap blocks. Machine includes 5 standard feed slides, 9 standard production units.

Because major components are standardized

KEARNEY & TRECKER TAKES THE "SPECIAL COSTS" OUT OF PRODUCTION MACHINE TOOLS



STANDARD ROTARY INDEX TABLE available in 4 different table diameters, any practical number of indexes.



STANDARD MILLING HEAD UNIT 4 sizes. Single spindle . . . various horsepower and speed ranges . . . single or double reduction drive . . . automatic quill retraction. Any size can be modified for boring.

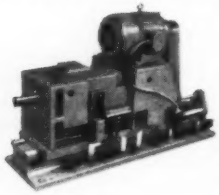
Here's a sound, proven *economical* approach to your production machine tool problems . . . Kearney & Trecker production machine tools featuring standardized components.

You get IMPORTANT SAVINGS—benefit directly three ways: (1) lower initial cost; (2) less lead time needed and (3) proven standard units mean efficiency *plus* simplified machine maintenance.

Ask the Kearney & Trecker man—he'll show you more examples of standardized machine components in production machine tools — the keys to capturing more profits from production!

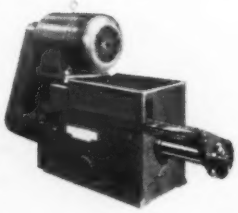
Kearney & Trecker Corp.
6774 W. National Avenue, Milwaukee 14, Wis.

STANDARD FEED SLIDE UNIT provides hydraulic feed for milling, boring or drilling heads. Available in 4 sizes and in various length cylinder strokes.



STANDARD WAY TYPE DRILL UNIT for drilling, boring, reaming, counter-boring and chamfering. Single and multiple spindle arrangements, single or double feed rates.

ASK FOR FREE KEARNEY & TRECKER Production Machine Tools Bulletin SMD-57. It provides full standard component details — and their application to production machine tools.



STANDARD QUILL FEED UNIT for drilling, boring, reaming, spotfacing, counter-boring and chamfering. Single or multiple spindle arrangements — single or double feed rates.

KEARNEY & TRECKER MILWAUKEE

Designers and Builders of Precision and Production Machine Tools Since 1898

ATLANTA, GA.
Scott Machine Tool Co.
411 Williams St., N.W.

BIRMINGHAM, ALA.
George M. Meriwether Industrial Equipment
1712 Seventh Ave. North

BOSTON, MASS.
Stedfast & Roulston, Inc.
11 Deerfield St.

BUFFALO 23, N.Y.
Syracuse Supply Co.
1965 Sheridan Drive

CHARLESTON, W. VA.
Wm. S. Bolden Co., Inc.
MacCorkle Ave.

CHATTANOOGA, TENN.
Scott Machine Tool Co.

CHICAGO, ILL.
Jackson-Fotsch Co.
7350 West Lawrence Ave.

CINCINNATI, O.
The E. A. Kinsey Co.
327-335 W. Fourth St.

NEW YORK, N. Y.
Kearney & Trecker Corp.
409 Grand Ave.
Englewood, New Jersey

NEW ORLEANS, LA.
Stauss & Haas, Inc.
524 Camp St.

OMAHA, NEB.
Fuchs Mach. & Supply Co.
2401 N. Eleventh St.

PHILADELPHIA, PENN.
Machinery Assoc., Inc.
325 E. Lancaster Ave.
Wynnewood, Penna.

PITTSBURGH, PENN.
Kearney & Trecker Corp.
4 West Manilla Ave.

PORTLAND, ORE.
Harry M. Euler Co.
2811 N.E. Gilsan St.

RICHMOND, VA.
Smith-Courtney Co.
Seventh & Bainbridge Sts.

For details, contact these

KEARNEY & TRECKER DISTRIBUTORS

or write to

KEARNEY & TRECKER CORP.
6776 W. National Ave., Milwaukee 14, Wis.

CLEVELAND, O.
Kearney & Trecker Corp.
Euclid Ave. & E. 17th St.

COLUMBUS, O.
The E. A. Kinsey Co.
1020 W. Fifth St.

DALLAS, TEX.
Greene Machinery Co.
6300 Wyche Blvd.

DAYTON, O.
The E.A. Kinsey Co.
16 Washington St.

DENVER, COLO.
F. J. Leonard Co.
1219 California St.

DETROIT, MICH.
Kearney & Trecker Corp.
10600 Puritan Ave.

GREENSBORO, N. C.
Smith-Courtney Co.
239 S. Davie St.

HICKORY, N. C.
Smith-Courtney Co.
103 3rd Street, S.W.

HOUSTON, TEX.
Steel & Machine Tool Sales
6414 Navigation Blvd.

INDIANAPOLIS, IND.
The E. A. Kinsey Co.
1550 Stadium Drive

KANSAS CITY, MO.
Blackman & Nuetzel Machinery Co.
1103 E. Armour Blvd.

LOS ANGELES, CALIF.
Moore Machinery Co.
3200 S. Garfield Ave.

MILWAUKEE, WIS.
Kearney & Trecker Corp.
6784 W. National Ave.

ROCHESTER 4, N. Y.
Syracuse Supply Co.
311 Alexander Street

ST. LOUIS, MO.
Blackman & Nuetzel Machinery Co.
3713 Washington Ave.

ST. PAUL, MINN.
Sales Serv. Mach. Tool Co.
2363 University Ave.

SALT LAKE CITY, UTAH
Todd Machinery Co.
4165 Holloway Drive

SAN FRANCISCO, CAL.
Moore Machinery Co.
7th & Carleton-Berkeley

SAN JOSE, CALIF.
Moore Machinery Co.
656 Stockton Ave.

SEATTLE, WASH.
Dawson Mach. Co.
5700 First Ave., S.

SHREVEPORT, LA.
Peerless Supply Co., Inc.
701 Spring St.

SYRACUSE 1, N. Y.
Syracuse Supply Co.
314-332 W. Fayette St.

TULSA, OKLA.
White Star Mach. Co.
104 Boulder Bldg.
19 West 10th Street

WICHITA, KAN.
White Star Mach. Co.
301 N. St. Francis

CANADA
MONTREAL
OTTAWA
QUEBEC
TORONTO
WINDSOR
Williams & Wilson Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 24

can be positioned properly in the various assembly stations.

3. If any of the parts must be positioned a certain way for assembly, external means to indicate from should be provided on the part for proper orientation.
4. Configuration of the various pieces assembled to the basic part should be such that they can be guided to the proper place for assembly without resorting to an overly complex distribution mechanism.
5. Part tolerances on these components must be held to permit the proper positioning relative to the major assembly. Sometimes it is necessary to hold part tolerances closer for automatic assembly purposes than is necessary in their final function in the product.

In addition to these five factors there are others which can have an effect. The location or grouping of the various components on the basic part is important from an accessibility standpoint. When automatic assembly is to be used, it is necessary that clearance be allowed around the component to be assembled in its final position for mechanical assembly devices. We usually find that such devices are somewhat more bulky than a man's finger or hand. At best close groupings can add stations to an automatic assembly machine; at worst they can make automatic assembly impossible.

Angular assemblies are not necessarily extremely difficult to handle, but they are usually more expensive than horizontal assemblies. When the design of a product involves mounting of components at angles, it is important that as many assembly operations as possible be handled at the same angle.

Location of screws on products being considered for automatic assembly can also have far reaching effects on cost. Screws which can very readily be inserted and tightened with hand tools can become virtually impossible to handle by automatic means.

A great deal of study is being given in industry to packaging small components in orderly manner so that they can be removed from the package and carried into the machine without the need for hoppers. Gaskets, for example, can be handled this way. A box or container of them would be shipped in from an outside source and unpacked automatically by the machine assembling them to a basic part. Washers and similar parts can be handled in the magazines in which they are shipped, in the same way.

SIMPLE CHANGES OFTEN BEST

Just as in the case of machining a product, design which allows for easy assembly may be difficult to obtain. But, in many instances, relatively simple changes may make the differ-

LUCAS-MILHAUPT

NO TANGLE NOTCH COIL BRAZING RINGS

No Waste of Precious Alloy

Preformed No Tangle Notch Coil Rings end wasted time in placing silver solder in position for brazing operations. Rings fit quickly and accurately on parts to be joined. Cut and try methods and resulting rejects are eliminated. Silver solder is actually metered to flow evenly into and around joints.

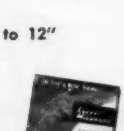
★ Quickly snapped off coil and placed on part.

★ No tangling or distortion in handling.

★ Minimum amount of precious alloy needed to obtain positive bond.

RING DIAMETERS from ¼" to 12" — + .001.

WIRE SIZES .020 to .093.



FREE...
16 page booklet gives you all the facts on better brazing with preforms. Write Today!

LUCAS MILHAUPT
ENGINEERING COMPANY

5090 SO. LAKE DRIVE • CUDAHY, WIS.
CIRCLE INFORM-A-GRAM KEY NO. 25

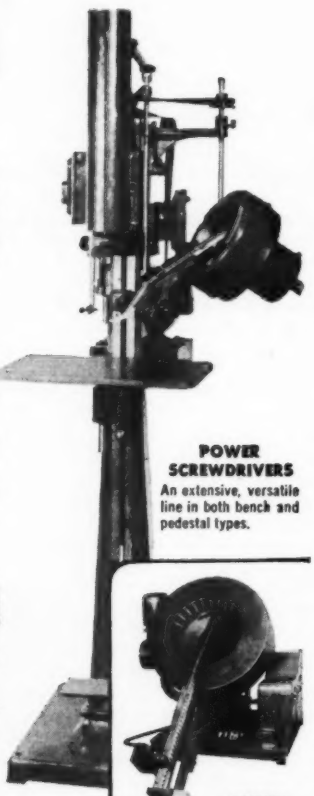
DPS has

the technical know-how to "engineer" more speed and profit into your assembling operations.

● The signal success of DPS trained engineers in adapting power equipment to the individual feeding and assembling needs of industrial plants everywhere is assurance that they can likewise solve your special problems. In our broad line of

SELECTIVE PARTS FEEDERS
POWER SCREWDRIVERS
SPECIAL ASSEMBLING MACHINES

equipment can be selected, and custom features incorporated, to fit your requirements. Plan now to use DPS modern assembling methods. Tell us your set-up. Write for catalog and further details.



POWER SCREWDRIVERS
An extensive, versatile line in both bench and pedestal types.

BOWL FEEDER
Electrical vibratory type to feed parts that cannot be tumbled.

BARREL FEEDER
with stationary ring cover for heavy-duty production.

BARREL FEEDER
Popular motorized type, for parts requiring critical selection.

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT STREET • DETROIT 26, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 26

ence between a manual assembly operation and an automatic assembly operation.

We have built a number of machines to assemble the various valve components to a cylinder head. As one of our operations we must channel the valve lock into a position adjacent to the valve stem, with the spring and washer compressed. The easiest way of doing this is by orienting the parts as they come from a hopper so that the small end will lead and deliver them in this proper orientation through chutes to a position around the valve stem, while the spring is compressed. We then release the spring, while holding the valve lock in position, until it engages with the retaining washer.

It is very difficult to guide a series of these locks through a chute without jamming them, because the two outside edges are not parallel, and provide only a point contact on the upper end of the valve lock as it goes through the chute. The key on the inside of the valve lock also provides us with a very short guide which permits cocking of the valve lock in the chute and subsequent jam-ups.

On a cylinder head assembly machine 38,000 of these valve locks are assembled in an 8-hr day. In order to operate at a reasonably efficiency, the percentage of workpieces passing through the machine properly without jamming must be very high. Anything in excess of one jam-up for each 10,000 locks passed would begin to be detrimental to the machine efficiency. Very frankly, we have had continual problems in guiding these parts and to a great extent the problems have come about because of the design defects I mentioned previously. By making a very slight change, we would have a design which functionally would be just as good as the previous design and would be infinitely better as far as automatic assembly is concerned. By using the entire length of the valve lock as a key, we would be providing full length guiding on the inside of the lock which would eliminate 95% of our jamming problems.

Many times by the time we receive prints and orders, which put us into a position to make suggestions, plans for fabricating the various parts have been carried out to such a great extent that to revise them would be impossible. There are a great number of more subtle changes which could help in the manufacture of any part, but are too small to ask for at the time assembly equipment is being considered, for unfortunately under the present scheme of things, assembly of the parts is looked into last and almost always at a time too late to make any changes.

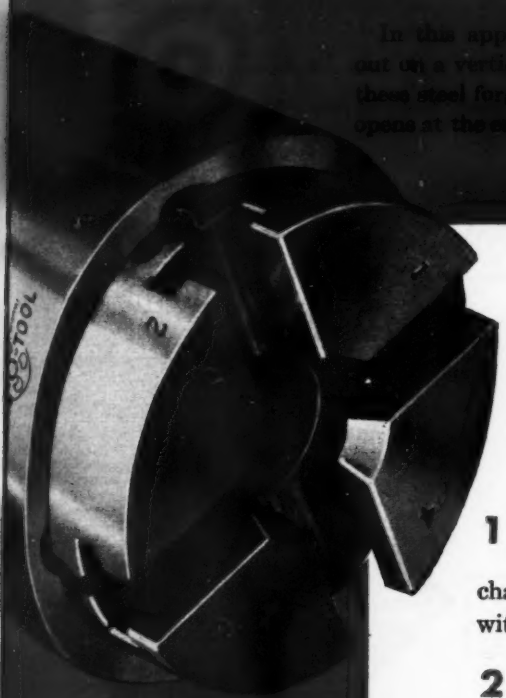
Our analysis of the manufacture of parts which must be machined and assembled indicates that if full con-

HERE'S HOW

Namco VERS-O-TOOL

cuts costs ... speeds production on end turning and forming

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.



Write today for your copy of 48-page catalog 01-52, or ask our representative to call.

VERS-O-TOOL

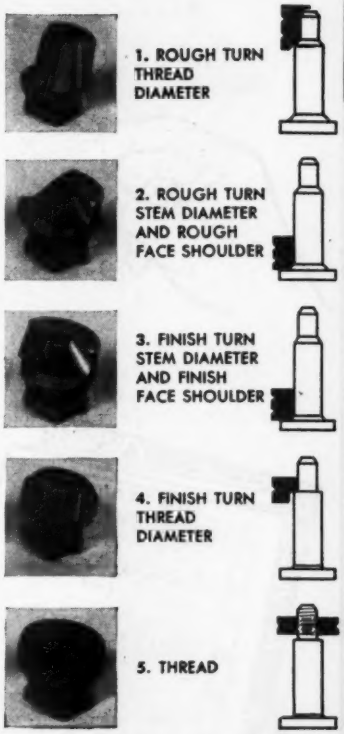
LICKS PRODUCTION PROBLEMS BECAUSE:

1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustments in the head.

2 All settings in the blocks are made in the toolroom with a micrometer gauge—no need for trial and error run after changing or grinding.

3 Simplicity of basic design means fewer moving parts—insuring long, trouble-free performance.

CIRCLE INFORM-A-GRAM KEY NO. 27



1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

National Acme

THE NATIONAL ACME COMPANY, 170 E. 131st ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J. Chicago 32, Ill. Detroit 32, Mich.

Northwestern TOGGLE-SHOE CLAMPS

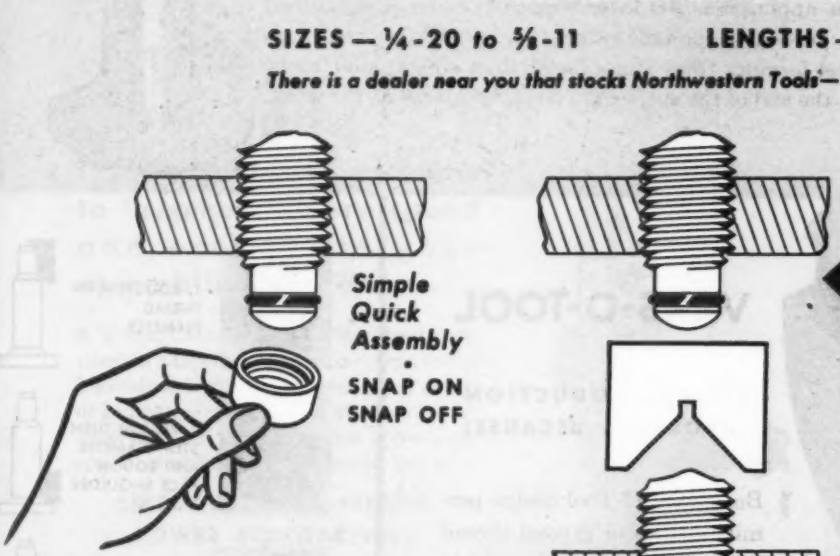
THREE NEW SOCKET TYPES! KNURLED SHAFT • KNURLED HEAD • HAND KN

ALL TYPES ARE INTERCHANGEABLE WITH *"SNAP ON-SNAP OFF"* ROUND OR V-PA

PATENT APPLIED FOR

SIZES — ¼-20 to ⅝-11 **LENGTHS — 1" up to 5¼"**

There is a dealer near you that stocks Northwestern Tools—Write for information.

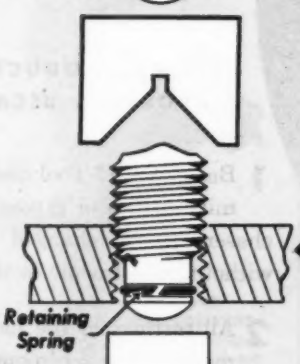


Simple Quick Assembly

SNAP ON SNAP OFF

10° ADJUSTMENT in all directions

Retaining spring hold shoe in place yet a lows a full 10° adjust ment in all direction

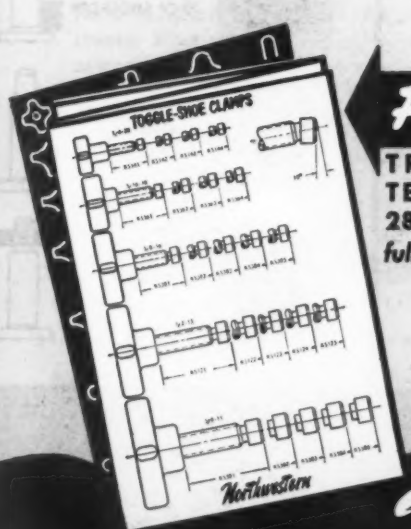


Retaining Spring

NO INTERFERENCE

Shoe only 1/16 larger than bolt

Short shoe design re quires a minimum dis tance between fixture and the work.



Free

TRACING TEMPLATE 286 ITEMS *full Scale • •*

HEAT TREATED for max. toughness

Screw is heat treated for long life—shoe heat treated to pre vent marring of work

CIRCLE INFORM-A-GRAM KEY NO. 23

116 HOLLIER AVE. **Northwestern** DAYTON 3, OHI

sideration is given to the assembly problems during the design of the product, the machining and material handling can usually be done without difficulty. The design which is easily handled through assembly operations will obviously be easily handled through machining operations.

DESIGN INFLUENCES

There are three strong influences on the design of any product:

- The engineering or functional design of the product.
- The appearance or styling of the product.
- The manufacturing of the product.

It is my opinion that the manufacturing influence, taking into consideration the latest methods in manufacturing practice, has the least influence of the three. This has come about because of the difficulty of mechanical design engineers to be completely familiar with all of the possible variations in manufacturing practice. Those of us who are working daily on manufacturing problems and techniques have difficulty in keeping abreast. It is easy to see where most product designers would have a job on their hands in keeping up-to-date with the technological progress in their own field.

I believe that the solution to a well balanced design will involve a three man team: the design engineer, the industrial designer, and the manufacturing engineer. It will be necessary for the manufacturing engineer to participate at the inception of the product design in order to do the most good. Decisions of the type which must be made involve a full consideration of the manufacturing objective, as well as the engineering objective. *You cannot, however, compromise engineering in the interests of manufacturing.* The right decisions will ease the manufacturing job and at the same time keep the functional operations which are the goals of the engineering designer. Obviously, to do this will require men in all three fields who are well aware of the problems of the other fields so that design problems can be solved by discussions on a common ground. In some of our industries, practices similar to what I have described above are already being utilized.

It is undoubtedly within our capacity mechanically today to build an automatic factory. Based on present production designs such a factory would, however, be very impractical because of the high cost of mechanization and because of the very low efficiency at which it would operate. To build such a factory which would operate efficiently and provide its benefits to our nation is our challenge today. It can be done by the cooperative development of new product designs tuned to the very latest in manufacturing methods and by the development of even better and simpler methods of manufacturing. end

Engineered with the quality features that make end milling jobs *pay off*

Engineered with the hardest practical grade of carbide to "breeze" through the toughest metal cutting applications.

Nelco end mills are precision ground all over—from shank to cutting edge.

174 different end mills—diameters from ⅛" to 3"—2, 3, 4, or 6 flutes—straight or taper shank—a tool for every application!
Specific cutting angles are engineered for each size and series of tools assuring smooth, prolonged performance on all materials.

Send today for the new Nelco catalog — over 700 tools, 700 ways to better production at less cost.

NELCO TOOLS *For that EXTRA Edge in Production!*

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

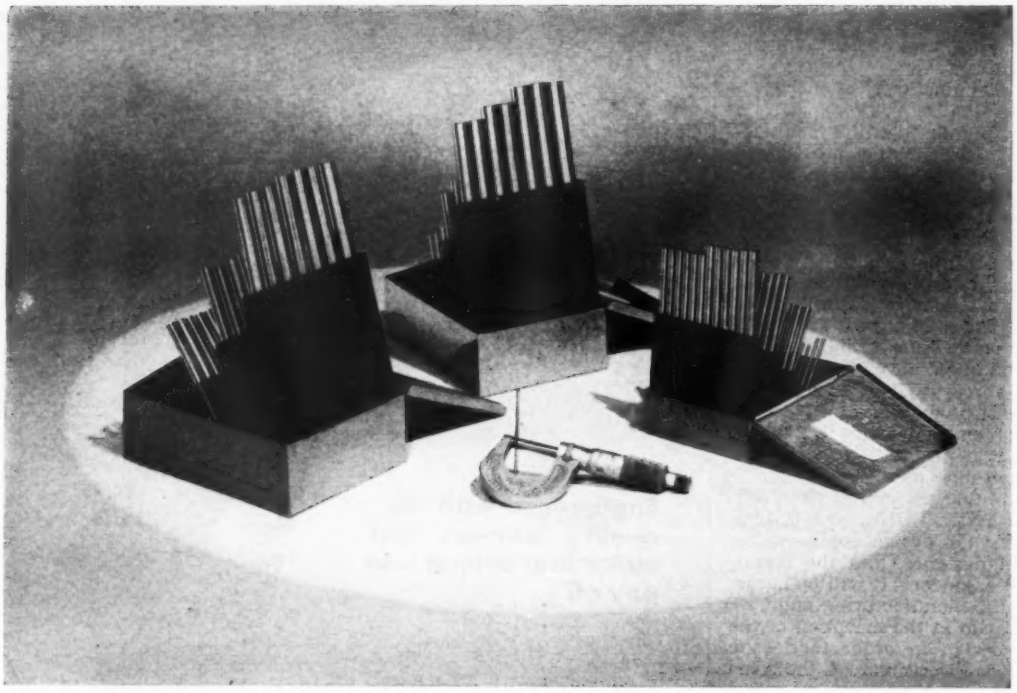
STOCK OF OVER 3000 STANDARD TOOLS!
Obtain impartial High Speed Steel, Carbide and Carbide Tipped tooling recommendations from your Brown & Sharpe-NELCO Distributor.

CIRCLE INFORM-A-GRAM KEY NO. 29

DRexel 6-4222 ESTABLISHED 1927

WILLIAM T. HUTCHINSON CO.
53 BROWN AVENUE SPRINGFIELD, NEW JERSEY

HUTCHINSON HSS BLANKS



115 Pieces – COMPLETE – .040" to .500" – $88.00

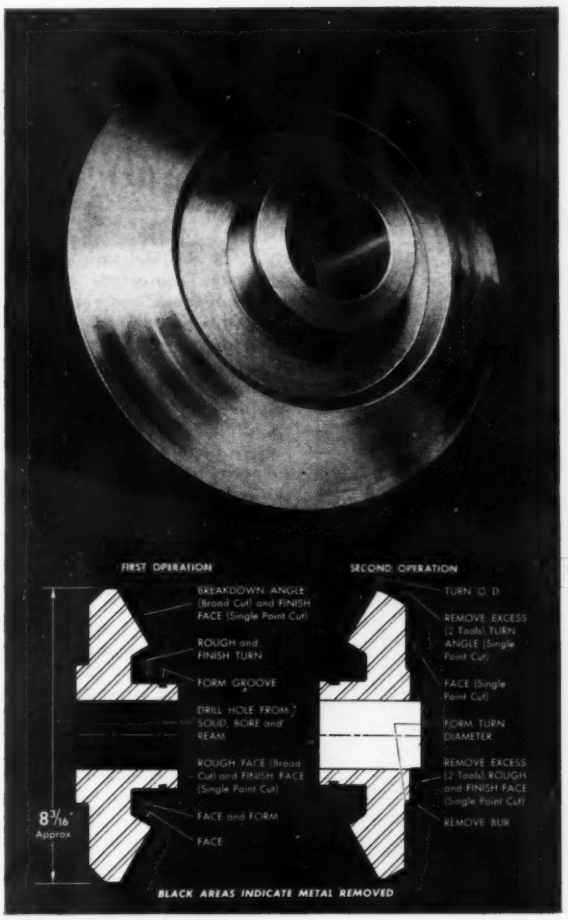
your choice of two tolerances
+ .0002" — .0000
or
+ .0000 — .0002"

JOBBER SET	LETTER SET	WIRE SET
$32.27	$29.03	$27.40
in Huot Index	in Huot Index	in Huot Index

HIGH SPEED STEEL — 64 "C" scale hard — gage tolerance — mirror finish. parallel ground

ANY DECIMAL DIAMETER OF STANDARD LENGTH .020" TO 1.000" SHIPPED ON 24 HOUR NOTICE

CIRCLE INFORM-A-GRAM KEY NO. 30


FIRST OPERATION
SECOND OPERATION
BREAKDOWN ANGLE (Broad Cut) and FINISH FACE (Single Point Cut)
ROUGH and FINISH TURN
FORM GROOVE
DRILL HOLE FROM SOLID, BORE and REAM
ROUGH FACE (Broad Cut) and FINISH FACE (Single Point Cut)
FACE and FORM
FACE
TURN O. D.
REMOVE EXCESS (2 Tools) TURN ANGLE (Single Point Cut)
FACE (Single Point Cut)
FORM TURN DIAMETER
REMOVE EXCESS (2 Tools) ROUGH and FINISH FACE (Single Point Cut)
REMOVE BUR
8 3/16" Approx
BLACK AREAS INDICATE METAL REMOVED

Let me show you how one of our P & J Automatics

put this

"PROBLEM" Job on a PAYING BASIS!

Some of the toughest machining jobs you'll ever have to handle get that way, *not* because of any *single* factor like extra-hard metal or really heavy cutting, but because of *several* contributing factors that can add up to a lot of machining time and a big profit loss. The job shown here . . . which one of our customers brought in recently . . . is a good example. A glance at the "Job Facts" will show you a combination of factors that could easily have made this job a real problem. The most difficult of these requirements was machining the bevels . . . which had to meet close tolerances for size and conformity to the true angle and, in addition, demanded a fine finish with *no* tool-return marks permitted. However, handling this part on a Potter & Johnston 4-U Automatic, with a tooling set-up engineered by P&J Tooling Specialists, put this potential headache on a high-output, high-profit basis.

HERE ARE THE JOB FACTS:

PART: *Bevel Gear*

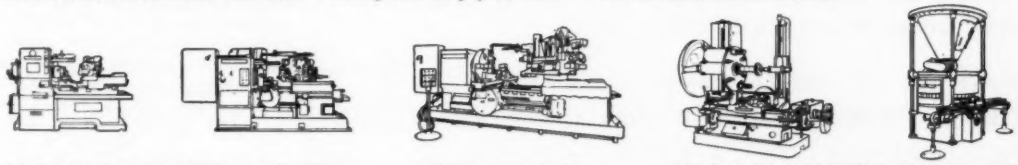
MATERIAL: *Steel Forging, 190 Brinell*

MACHINING REQUIRED: *22 separate roughing and finishing cuts including several hard-to-handle angle cuts.*

SPECIAL REQUIREMENTS: *Hold bevel angles to close tolerances and produce a good finish.*

RESULTS: *A part finished every 13 minutes floor-to-floor time . . . on a P&J 4-U Automatic!*

A new P&J Automatic can put *your* problem jobs on a paying basis too! Send me your sample prints and I'll show you how a P&J Automatic with P&J Tooling can help you turn out your toughest jobs faster, better and at lower cost. Write Potter & Johnston Company, Pawtucket, Rhode Island.



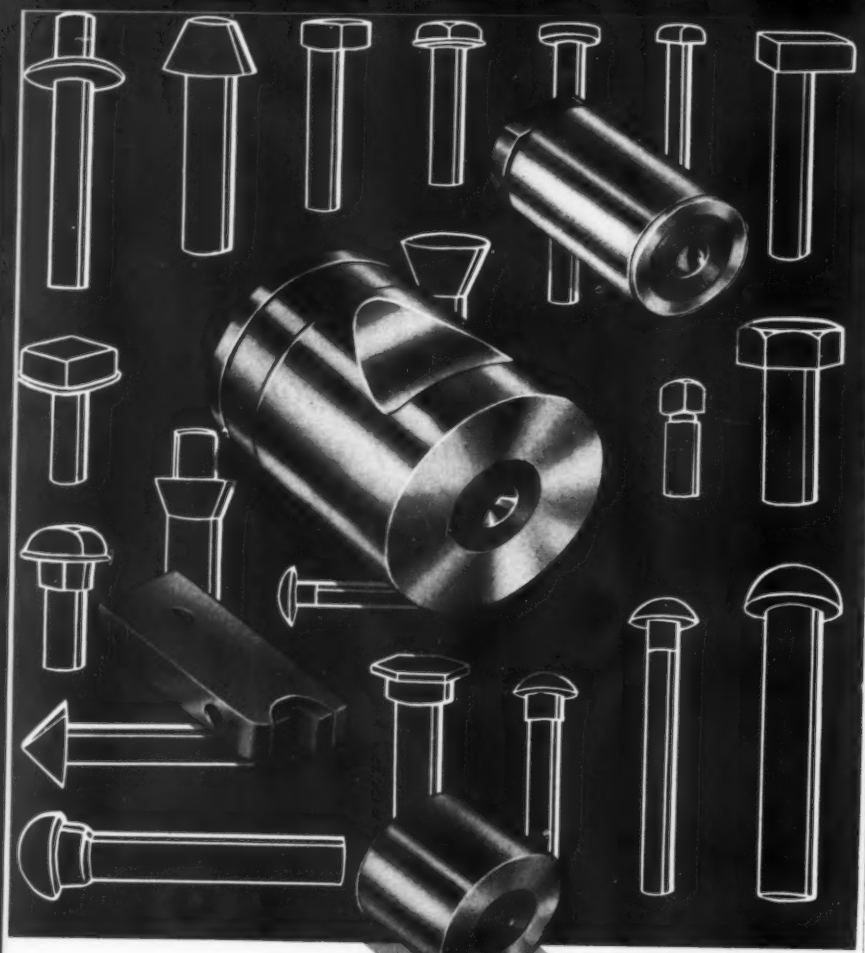
AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . GILDA PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

CIRCLE INFORM-A-GRAM KEY NO. 31



Cold-Heading Costs Far Less . . .

WITH P&W-JAQUITH CARBIDE HEADER DIES, PUNCHES, CUT-OFF QUILLS AND KNIVES . . .

Compared with steel tooling, they run longer, produce more and require lower inventories. Improved quality increases product acceptability, cuts inspection costs. These carbide tools are now offered as stock items for National and Waterbury Farrel Cold Heading machines. Specials can be furnished on short delivery from available blanks.

Write now for complete information. Jaquith Carbide Division, Pratt & Whitney Company, Inc., 15 Stewart Street, Lynn, Massachusetts.

JAQUITH CARBIDE

DIVISION OF PRATT & WHITNEY COMPANY, INC.

SPECIAL DIES • COLD HEADER PARTS • WEAR PARTS

CIRCLE INFORM-A-GRAM KEY NO. 32

"Commendable Comments"

". . . in this dynamic and expanding world the competent engineer has to lead a dynamic and expanding life. In my judgment there is simply no room left for any routine approaches to engineering, or for standing still with the mental equipment we have. The engineer has to grow and change with the times, and constantly equip himself to handle new problems. He has to nourish his mind and broaden his outlook to make sure that neither gets obsolete. And, at all times, he has to look ahead."

—F. R. Kappel, president, American Telephone & Telegraph Co., at the Winter General Meeting of the American Institute of Electrical Engineers.

"Many machines and machine tools may continue to be functionally useful for as long as 20 years, but they have long been outdistanced in economy and efficiency by newer improved machines that can do similar jobs at greater speeds and lower costs and with far more versatility, superior precision, and higher quality."

—James C. Kelley, general manager of the American Machine Tool Distributors' Association.

". . . good times for businesses both large and small, depend chiefly upon the businessmen themselves — their initiative, energy, progressiveness and ingenuity. Government cannot turn business on or off by decree . . ."

—Wendell B. Barnes, administrator Small Business Administration, before the National Machine Tool Builders' Association meeting in Washington.

"The industries supporting us serve, in essence, as our 'arsenals' and accordingly must be sensitive and responsive to the technological revolution in air weapons that has taken place and is rapidly progressing. These advances, grounded in military necessity, will change significantly the scope and character of our industrial structure over the next several years. Most importantly, the company and industry composition of this structure may shift radically unless each participating member recognizes what is happening and adapts and adjusts to the changing requirements for his future role."

—Maj. Gen. David H. Baker, Air Materiel Command, in addressing the Society of Business Magazine Editors in Washington.

". . . there is no need for anyone to fear radiation, but we all must have a healthy respect for it."

—William A. McAdams, General Electric consultant on radiation protection, at the recent Greater New York Safety Council convention.

Myles A. Snyder has been assigned as an abrasive engineer in Chicago for Norton Co. **John E. Taylor** has become an abrasive engineer and will take over the territory formerly covered by Mr. Snyder, which takes in western Iowa and parts of Nebraska and South Dakota.

◆

A. D. Charboneau has been added to the Detroit application engineering staff of Hydro-Line Mfg. Co. He will work with designers and builders of machinery equipped with cylinders for automation and other work processing functions, as well as manufacturing companies in metalworking, processing, construction, and similar industries.

◆

Ernest B. Meynard has been elected vice president, sales by Buckeye Tools Corp.

◆

John H. Wright has been appointed field engineer for Nelco Tool Co. He will serve as liaison for the carbide tool user, the distributor, and Nelco plants in Manchester and Berlin, Conn.

◆

Announcement of the appointment of **F. V. Gieryn** as sales manager, Industrial Department, has been made by Vickers Inc. In his new capacity, Mr. Gieryn will supervise sales of Vickers hydraulic units and systems for machine tools and other plant production machinery through 20 industrial sales offices throughout the country.

◆

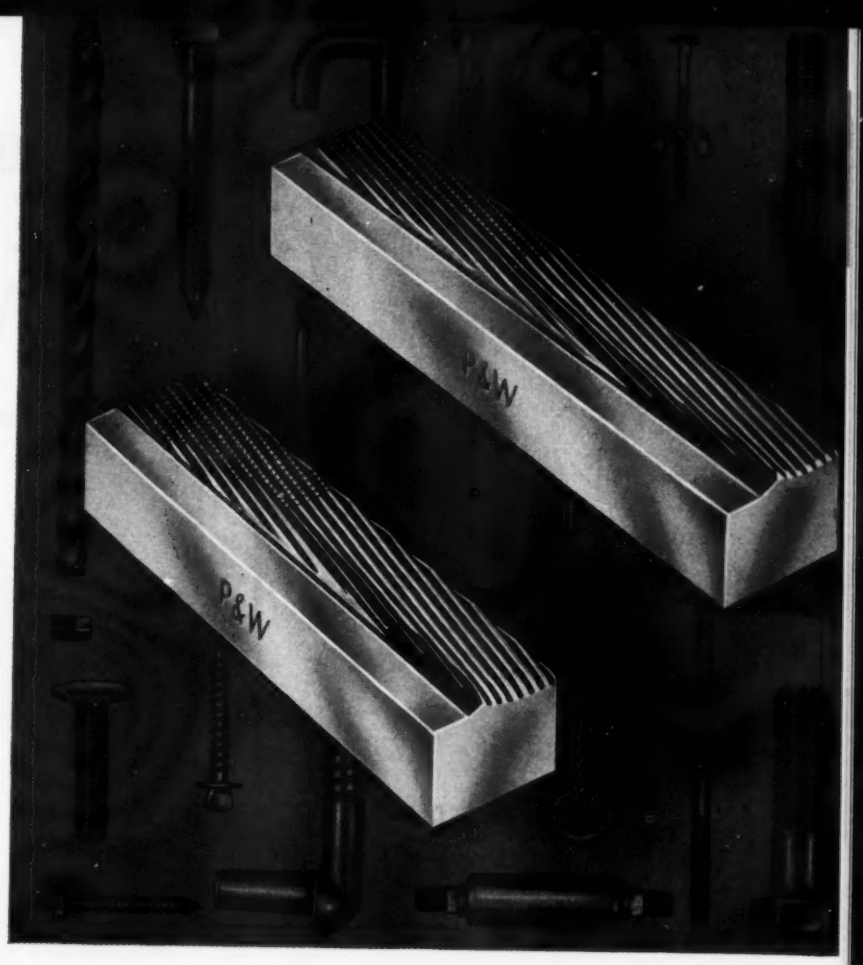
Mrs. Dorothy Ford has become a factory sales representative for the Punch Division of Pivot Punch and Die Corp., covering the New York area.

◆

The new sales engineering representative for the Hydraulics Products Division of Brown & Sharpe Mfg. Co. is **Bryan W. Moylan.** He is responsible for the development of markets along the Eastern seaboard.

◆

The Abrasives Division of Elgin National Watch Co. has named **Bernard T. Martin** as sales engineer in the upper New England area. **Roy Zahn** will continue to handle sales activities in the southern portion of the territory, which was divided to provide improved service.



ROLLING Produces More Accurate Threads...FASTER!

WITH P&W-STERLING THREAD ROLLING DIES

. . . Thread Rolling is rapidly replacing older production methods. Long-wearing P&W-Sterling Dies produce threads that are more uniform and accurate than cut threads and have a hard, burnished finish. Important savings in material are realized. Production rates are very high, production costs low. Sterling Dies are stocked and sold by the P&W Branch Office near you.

Write today for complete information. Sterling Die Division, Pratt & Whitney Company, Inc., 13811 Enterprise Ave., Cleveland 11, Ohio.

STERLING DIE
DIVISION OF PRATT & WHITNEY COMPANY, INC.
THREAD ROLLING DIES FOR ALL APPLICATIONS
CIRCLE INFORM-A-GRAM KEY NO. 33

NEW

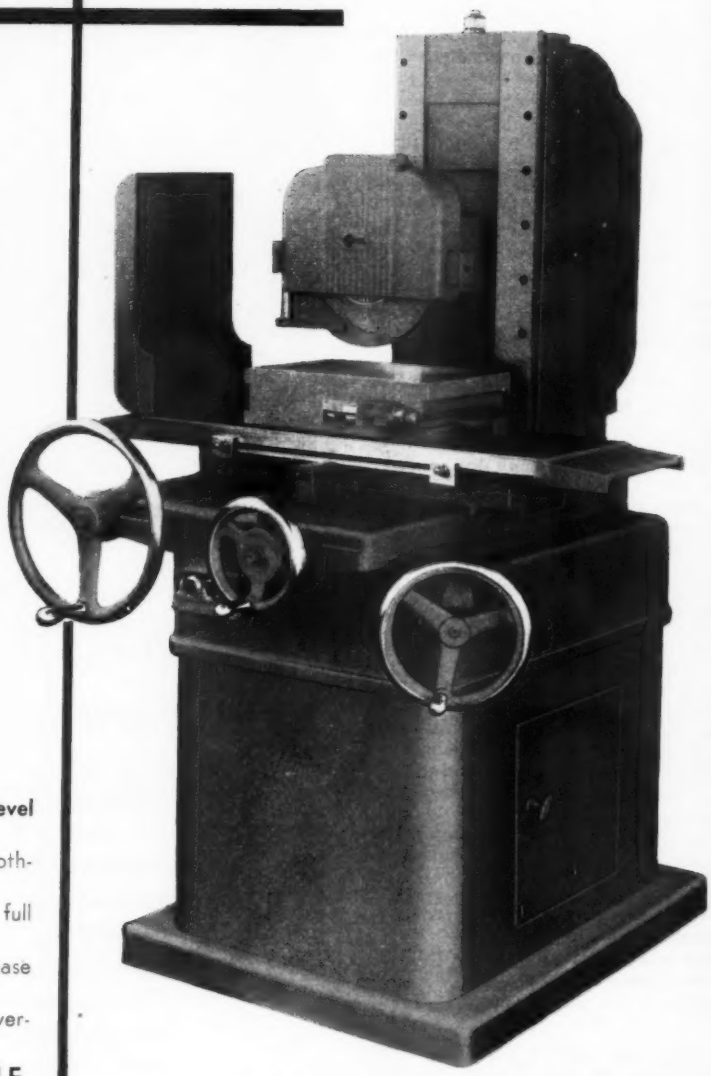
Surface grinder gives you LARGE CAPACITY at LOW cost...

COVEL

No. 17

10" x 16" HAND FEED

Set-up time and operator effort are reduced while accuracy is increased by the advanced Covel design features incorporated in this new surface grinder. You can handle die block and general tool room work with remarkable efficiency and speed with the new Covel No. 17 which gives large capacity at low cost.



Note these advanced Covel features:

- **Elevating handwheel** is **below table level** for extra convenience.
- **Timing belt drive** actuates table for smoother grind.
- **Large diameter handwheel** moves table full 16" with only 2¾ turns.
- **Precision ball-bearing spindle** is grease lubricated—sealed for life.
- **Hardened and ground lead screws** on vertical and transverse feeds.

WET ATTACHMENT AVAILABLE

- **Hard chrome table ways** can be furnished to eliminate need for periodic re-scraping.

Work Capacity	Grinding Wheel	Spindle Motor	Spindle Speed
10" x 16" x 14"	12" x ¾" x 3"	2 H. P.	1750 RPM

- ***Learn all the facts about the Covel No. 17. Ask for Bulletin 17TP7.***

Covel Offers the Widest Choice in Surface Grinders up to 14" x 24" • Cutter and Tool Grinders • Drill Grinders • Optical Comparators.

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 34

FILMS TO SEE

"Arbitration" is a training film which presents an actual hearing of a labor-management dispute. The film shows how a typical arbitration hearing is conducted, what is expected of participants, and how this collective bargaining technique operates to benefit workers and employers alike. A leader's guide accompanies the film. This 16 mm movie, which runs 30 min, can be rented or purchased from American Management Association, 1515 Broadway, New York 36.

•

Sixty films available from member companies are reviewed in a catalog from The Material Handling Institute, Inc., Suite 759, 1 Gateway Center, Pittsburgh 22. These movies cover batteries and battery care, conveyors, cranes, fork lift trucks, and lift truck attachments. Other film subjects are general material handling, maintenance, mechanized and overhead handling, and safety.

•

"When the Chips Are Down" is a factual study of the progress of the Machinability and Development Laboratories of The Monarch Machine Tool Co. It presents a report of the company's approach to such turning problems as feed, speed, and tooling. Shown are the practical applications of such research in improved design of lathes and lathe components. Animated drawings and close-up views are used to explain the shear process, proper heat balances, plastic flow, and other factors in the control of tool life. The 16 mm film with a 22-min running time is loaned free-of-charge by The Monarch Machine Tool Co., Sidney, O.

•

"Aluminum Finishing" demonstrates every aspect of aluminum finishing from pre-cleaning prior to conversion coating, to painting and final assembly. Filmed on location during the production of aircraft fuel tanks, the movie covers the manufacturing cycle necessary to paint and complete the tanks. In addition, the film shows the various paint adhesion tests to which the tanks are subjected. Also, the movie describes a detailed laboratory sequence. Complete information on the film can be obtained by contacting Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1.

he HAD to use a hand brace!

but YOU can use a Buckeye Air Tool!

Buckeye "A" Series drill, with offset handle, being used on an aluminum drilling operation. Clips hold panels in position after holes are drilled.

Why AIR Tools?

Because air is everywhere, just waiting to be put to work . . . because continuous operation can't possibly harm an air tool . . . and because, if you're using Buckeye air tools, you can almost forget about tool maintenance.

Drilling ten or a thousand holes an hour . . . in metals, woods or plastics . . . is faster, safer, easier and cheaper if you're using a modern Buckeye air drill. You'll do better work, too, because you can concentrate on accuracy, letting the Buckeye tool do the muscle work. There's a complete range of drills listed in our Catalog A-10—may we send you a copy?

In Air Tools, Your Best Buy Is Buckeye

Buckeye Tools CORPORATION

DIVISION 19 • DAYTON 1, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 35

AEROPARTS MANUFACTURING COMPANY'S RECIPE FOR SUCCESS

Take on the Tough jobs put them on a Warner & Swasey

R. E. Radford started his company in Tulsa, Oklahoma, in 1943 with a $350.00 investment. Today, his new 40-man plant does sub-contracting on a national scale with a reputation for price and quality.

But, success was not immediate. Even as late as 1952, business prospects looked dim. Then, a man's resourcefulness plus a new kind of machine teamed up to start a literal chain reaction of success. Here's how it happened.

Radford had the idea that there was a profitable future in taking on the tough jobs that were not desirable to other companies. He also had faith to back his convictions. Now all he needed was the right machine to do the job . . . his search was a short one . . . the new Warner & Swasey 1 AC looked like the machine.

This new single spindle chucker allowed him to expand from his former policy of making screw machine parts to one involving larger, more complicated work . . . permitted him to run short cycle jobs at close tolerances of .001" and less . . . hold micro-inch finishes down to 20 RMS . . . make full use of the machine's late cross slide, flexible tooling characteristics. The dependability of this machine impressed him as much as did its productivity.

These advantages, and others that soon reflected themselves in increased values rendered to his customers, brought more business. So another Warner & Swasey 1 AC was installed in 1954 and a third in 1955.

Today, men and management at Aeroparts maintain their high regard for their Warner & Swaseys. And in "Tex" Radford's words, "These machines were integral in the growth of this company!"

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS

...WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

CIRCLE INFORM-A-GRAM KEY NO. 36

Sharpening the blades of 88 blade RIGIDCUT 15 in. diameter cutter. Note the remarkably clean design

WESSON Milling Cutters Show How to Get Top Production, Life

Sometimes the tool itself has to show you what CAN be done.

For instance, take the problem of milling the cylinder block ends for an important CAR ABOUT TO BE ANNOUNCED. To get top results on this job, calculations showed the face milling cutter should be 15 in. diameter and have some 88 blades. Of course standard blades were preferred to keep cost down.

Where to find such a cutter?

After studying all makes, the engine builder found that there was just one type of cutter that could do all this and also had the necessary rigidity and strength.

That cutter had already proved itself in a year and a half of service *in Cleveland, Detroit and Lima.*

It was the **WESSON** Standard High Speed Fine Finish Cutter—one of **WESSON'S** famous RIGIDCUT Series.

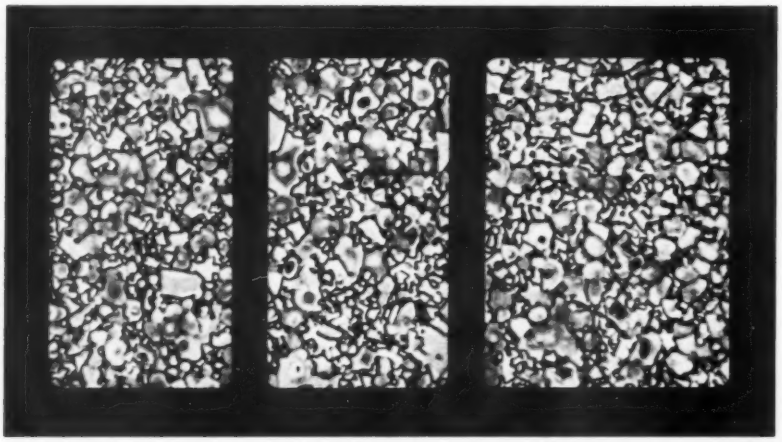
Reason: With the **WESSON** design you can use standard carbide tipped dovetail blades. *No space is needed in the gullet for the lock.* The blades lock from the bottom. You get smooth chip flow, with no obstructions, remarkable rigidity, solid blade backing.

Its no wonder that **WESSON** Rigidcut mills are setting new production records for output and tool life in all kinds of operations, everywhere.

If you are not familiar with Rigidcut milling cutters, our merchandising department will send you complete information. Just write on your company letterhead. You'll be glad you did.

TOOL NEWS carbide

"Inside Story" of Grades Told in Selector Bulletin



1500X Photomicrographs of the same Wessonmetal grade. Note close similarity.

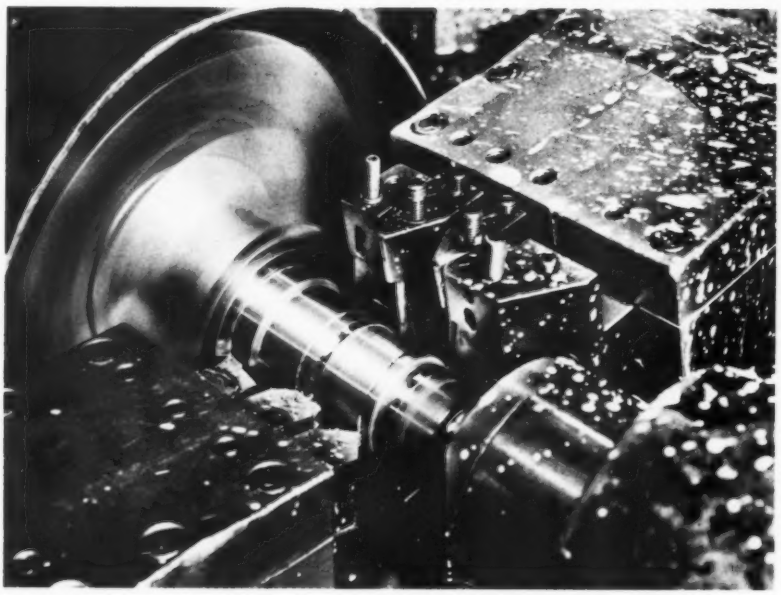
You can find a quick answer to what grade of carbide to use (and why) in a new technical bulletin just released by **WESSON**.

The bulletin tells how various ingredients added to tungsten carbides affect performance and tool life. You can use it as a standard method for selecting and applying carbides on the basis of operational needs in your own plant.

It is the soundest method of carbide grade selection *when carbides are as consistent* in chemical analysis and physical characteristics as are the various Wessonmetal grades.

Ask for Bulletin No. 57-1 WM.

Multi-Cuts Cut Waste Time 90%

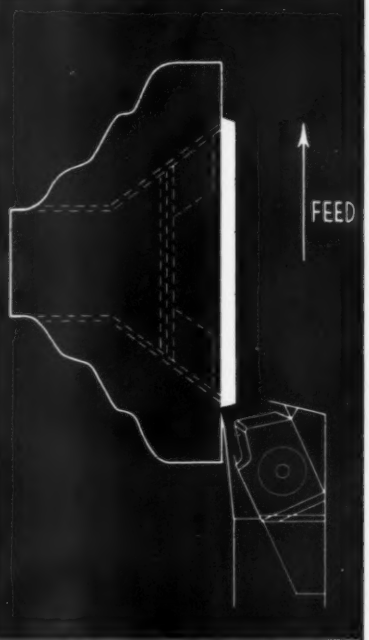


"A production of over 1400 parts per grind, compared with about 200 pieces per grind previously" is one report on **WESSON** Multi-cut band type tools with indexable inserts. They are indexed only once every shift. In addition, the report says, the grooving tools shown here helped to cut total machine service time by 90%. Tool pre-setting time is completely eliminated. Downtime for tool changes is cut in half. And grinding time is cut 80%.

tools Wesson carbide Wessonmetal

WESSON COMPANY DEPT. AB
[illegible] Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
[illegible] JUDGE ROAD, TORONTO 18, ONTARIO

Throw-Aways Throw Costs for Loss



Here are a few typical figures that tell their own story probably better than we can. The job is the facing of a shell-molded diffuser. The column at the left is for a conventional flat tool. The one at the right is for a **WESSON** THROW-AWAY:

	WAS	IS
Tool change time (secs.)	300	30
Pcs. per tool change (index)	130	280
No. of grinds or edges	10	8
Cost per grind	$0.25	None
Tool grind cost	2.50	—
Initial tool or insert cost	3.15	1.58
TOOL COST PER PIECE	.024	.0071

Want some specs on **WESSON** throw-away tooling? Ask for Bulletin No. 55 10 M.

LITHO IN U.S.A.

We hate to admit it but we had trouble with a

Bellows Air Motor

in Reading, Pennsylvania

Bellows Air Motors — the unique air cylinder with the built in valve — have established enviable records for trouble free performance. Operating cycles of 20,000,000 to 30,000,000 without maintenance of any kind are quite common. Fifty million cycles nothing unusual.

But trouble sometimes occurs — even in the best regulated families. A few weeks ago we received a phone call late at night. A Bellows Air Motor on an important production line had gone haywire. Could we ship a replacement immediately? We did better than that. We had a Bellows Field Engineer at his plant at 8:00 the next morning. At 9:00 the line was back in operation.

More than 125 Bellows Field Engineers (one or more in every major industrial area in the United States and Canada) are your assurance that if you ever do have trouble with any Bellows equipment it will be remedied quickly with minimum down time. (But between us girls, trouble with Bellows "Controlled-Air-Power" Devices is most unusual!)

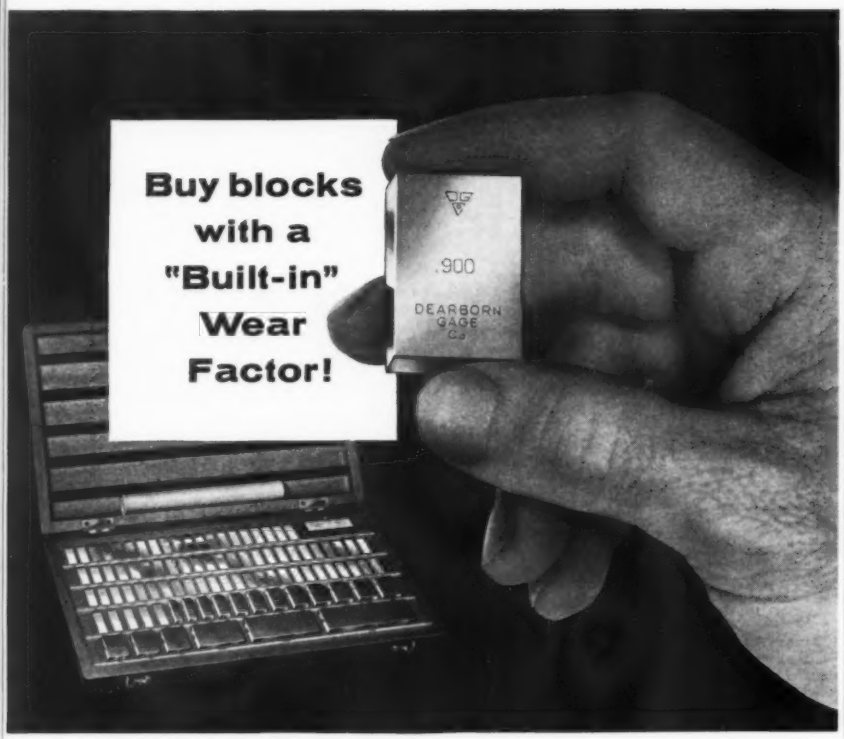
The Bellows Co.

AKRON 9, OHIO

MANUFACTURERS OF CONTROLLED-AIR-POWER DEVICES FOR FASTER, SAFER, BETTER AND **LOWER-COST** PRODUCTION

830-B

CIRCLE INFORM-A-GRAM KEY NO. 39



ELLSTROM CHROMIUM PLATED GAGE BLOCKS are guaranteed "minus nothing" from nominal size!

Here at last are gage blocks with a positive "built-in" wear factor! The only blocks ever produced and priced as standard with dimensional accuracy unconditionally guaranteed to be within specified millionths on the "plus" side of nominal block size and minus "zero" . . . absolutely nothing . . . undersize!

This complete elimination of the conventional minus tolerance gives you, the gage block user, three new and exclusive benefits. First, it provides positive assurance against receiving new blocks that are actually "worn" undersize during manufacture before they are ever used. Second, it gives you finer, more practical accuracy . . . with the sure knowledge that every Ellstrom block you buy will start wearing *toward* its nominal size rather than *away* from it. And third, it gives you a guaranteed minimum wear factor equivalent in millionths to the full minus tolerance specified as standard for all other makes of blocks!

Write for descriptive literature containing complete price information today!

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE COMPANY

"Measuring in Millionths for Three Generations"

22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Ellstrom Gage Block Accuracy Guarantee

"W"—WORKING ACCURACY BLOCKS
Measured Length: +.000008"/−.000000"
Parallelism: .000004" Flatness: .000004"

"I"—INSPECTION ACCURACY BLOCKS
Measured Length: +.000004"/−.000000"
Parallelism: .000003" Flatness: .000003"

"L"—LABORATORY ACCURACY BLOCKS
Measured Length: +.000002"/−.000000"
Parallelism: .000001" Flatness: 000001"

Ellstrom—your best buy in gage blocks for shop and tool room use, inspection and laboratory applications. Available in 28 standard sets ranging from 8 to 92 blocks in both square and rectangular styles with or without basic gage block accessories.

CIRCLE INFORM-A-GRAM KEY NO. 40

THE PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE, Eleventh Edition. Published by The Lincoln Electric Co., Cleveland 17, Ohio, 1957. Over 1,300 pages, 1,100 illustrations, $3. ($3.50 outside U.S.A.)

The contents of this revision range from the early history of arc welding to the intricacies of structural design. Its eight sections are: history, nomenclature and processes, weldability, mild steel procedures, manufacturing cost data, machine design, structural design, applications and reference data.

The 465 page structural section has been completely rewritten and includes the latest data on welded design, as found in recently built structures and current research.

The machine design section presents an entire machine design system which directs the designer from his starting point of "what the machine must do" to a completed design. The system is a logical procedure insuring consideration of all pertinent factors and leading to an economical design which puts the right amount of material in the right places.

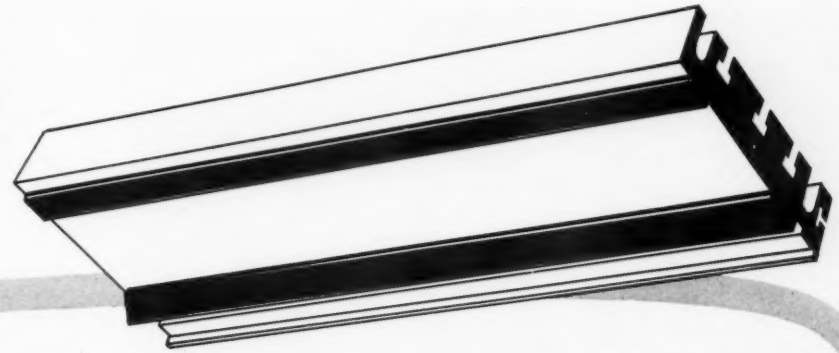
The weldability section presents information on how to weld all of the commonly welded metals, including such new materials as zirconium and titanium. The mild steel welding procedure section gives detailed welding procedures for all joints. Also included in the one volume is data on the new iron powder manual electrodes, as well as new automatic procedures and the latest information on hardsurfacing, carbon arc work, tool and die welding, pipeline, piping and code welding.

STANDARDS ARE EVERYBODY'S BUSINESS, Proceedings of the American Standards Association's Seventh National Conference on Standards. Published by the American Standards Association, 70 E. 45 St., New York 17, N. Y. 103 pages, $4.

The 33 papers presented at the conference, held in conjunction with the ASA's 38th Annual Meeting, are contained in this one paper-bound book. Special sections are devoted to dollar savings through standards (case histories), screw thread standardization, steel specification standards, and standardization and atomic energy.

. . . *Continued on Page 42*

* Pioneered by Covel and first introduced at the 1947 Machine Tool Show. Available on all Covel surface grinders.



Save Re-scraping...Save Money! with COVEL HARD CHROME TABLE WAYS*

COVEL No. 10 SURFACE GRINDER

6"x18" Hand or Power Feed

Engineered to give you the most accurate gage, form tool and surface grinding performance at *low initial cost*. Smooth timing belt drive, hardened and ground lead screws and rigid vertical slide insure precision operation.

Hard Chrome Table Ways Reduce Maintenance Costs

This Covel introduced feature preserves the built-in accuracy of hand-scraped ways for extra years of precision service.

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

Write for FREE BULLETIN

For all the facts about the rugged low cost Covel No. 10. Write Dept. TP-57.

THE MOST COMPLETE LINE OF SURFACE GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS • OPTICAL COMPARATORS

CIRCLE INFORM-A-GRAM KEY NO. 41

SYNTRON

"Vertical-Vibratory"

PARTS FEEDERS

Syntron Parts Feeder with gravity feed track and controlled escapement.

Provide, high-count oriented feeding of small parts to automatic machinery.

SYNTRON Parts Feeder with their gentle vibrating action and instant controllable rate of feed, successfully handle glass, ceramic finished parts that are impossible to handle with mechanical feeders. Parts that were once limited to slow manual feeding.

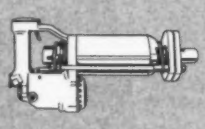
SYNTRON Parts Feeder save man hours, increase production, cut production costs by transforming ordinary deburring, marking, indexing assembly, packaging and other machinery into economic, efficient, dependable automatic operations. They are easily installed, adaptable to automatic machinery by means of a gravity feed track with controlled escapement, as illustrated above. Each Syntron Parts Feeder is custom designed for parts to be handled.

Send samples and details to our applications engineers for complete information and recommendation.

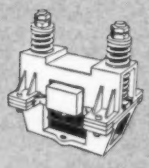
Builders of Quality Equipment for more than a Quarter-Century.

Other SYNTRON Equipment of proven Dependable Quality

ELECTRIC HAMMER DRILLS



BIN VIBRATORS



VIBRATORY FEEDERS

Write for complete catalog data — FREE

SYNTRON COMPANY

341 Lexington Avenue Homer City, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 42

. . . Reviews from Page 40

SYMPOSIUM ON SOLDER. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1957. 190 pages, $3.

The sixteen papers in this Symposium were presented at the 59th Annual Meeting of the ASTM. They explore the problems of soldering as they exist chemically, physically, and metallurgically, and illustrate the vital role of fluxes, solder compositions, and applications in attaining satisfactory service performance of soldered joints. Manual, mechanized, and ultrasonic techniques of soldering are covered, and the role of standardization in solder technology is emphasized. A system for evaluating fluxes, solder alloys, and solderability in numerical terms is also included in the symposium report.

AIRCRAFT HYDRAULIC DESIGN, by George R. Keller. Published by The Industrial Publishing Corp., 812 Huron Rd., Cleveland 15, Ohio, 1957. 132 pages, $4.50.

The advance of industrial hydraulics in servo components and systems for high-speed, piloted aircraft and missiles should make this book of value to designers of industrial equipment as well as aircraft engineers.

Developed from practical and theoretical material, the first section of the book is devoted to basic theory, treating properties of aircraft fluids, hydro-machanics, and fluid flow through tubing. Many practical equations are developed including those relating pressure gradient, flow dimensions, flow rate velocity, fluid density, and viscosity.

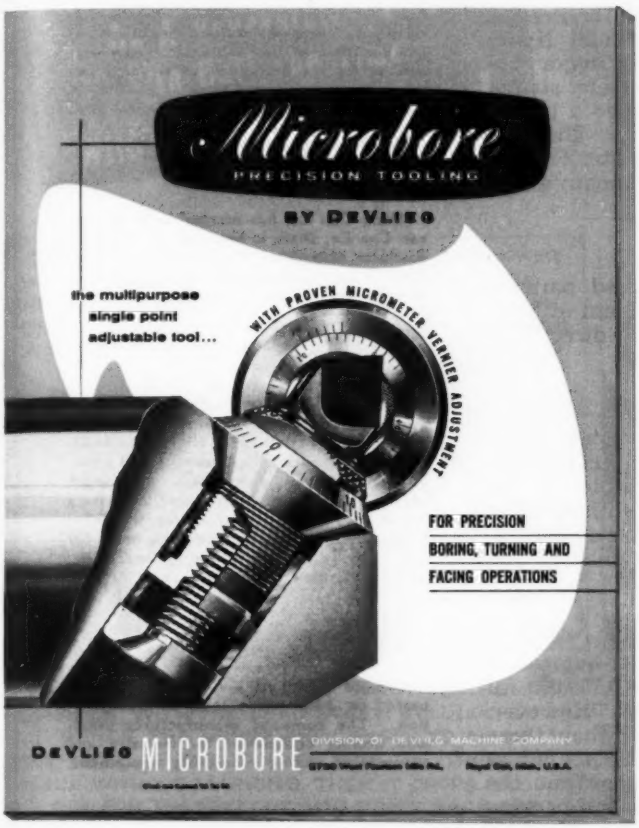
Design of system components including actuators, valves, pumps, accumulators, transmission lines, and seals is discussed in the second section. Hydraulic power servos and high temperature hydraulic problems fill the third section.

FIVE MINUTE SAFETY TALKS FOR FOREMEN, Book 7, prepared by Roland F. Blake. Published by the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill., 1957. 52 talks, single copies $1.95.

The 52 talks on accident prevention fundamentals included in this book come with an outline and text suitable for either informal or scheduled training sessions. It includes up-to-date material on such varied topics as vacation safety, smoking, horseplay, how to use various hooks, lung safety, and hot weather hints. Roland F. Blake, who prepared the book, is a leader in safety engineering and editor and co-author of "Industrial Safety," a book on accident prevention fundamentals.

now a completely new DeVlieg Microbore Catalog

listing 332 standard general purpose boring bars

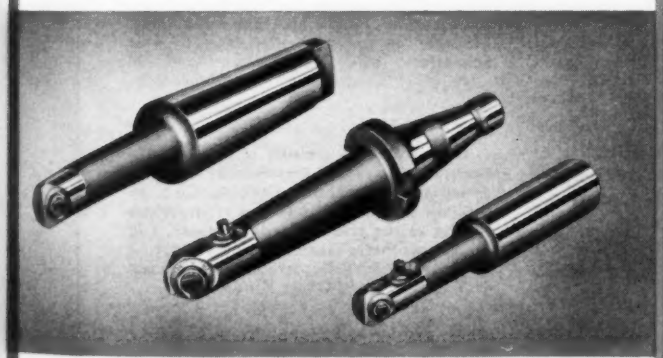


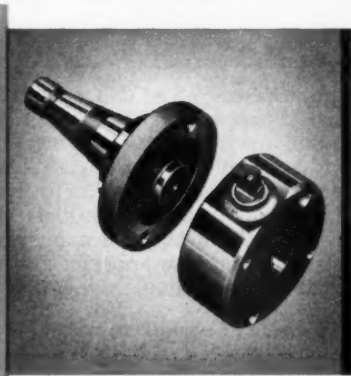
. . . FOR USE ON ALL MAKES AND TYPES OF BORING MACHINES, MILLING MACHINES AND TURRET LATHES!

Yes sir, you'll find it a constant aid. The new descriptive Microbore Catalog No. 58 presents a comprehensive range of newly designed Standard Single Tool and Two Tool Boring Bars, Boring Bar Sets and accessories. It also includes complete application, dimensional and carbide data.

Unique flip charts with simple engineering illustrations make it fast and easy to select the correct Boring Bar with NMTB Taper, Morse Taper or Straight Shank for a specific application.

STANDARD MICROBORE BORING BARS, BORING RINGS AND BORING RING ADAPTERS ARE AVAILABLE SINGLY OR IN SETS





MAIL THIS COUPON TODAY

DeVlieg Microbore

DIVISION OF DE VLIEG MACHINE COMPANY
2720 West Fourteen Mile Rd., Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 43

Please send me a copy of your new Microbore Catalog No. 58.

Name _____

Company _____

Title _____

Address _____

City _____ Zone _____ State _____

TP

MANUFACTURING MEMOS

Nominations Open for PMI-Presteel Award . . .

● Names of candidates for the annual PMI-Presteel award are now being accepted by the Pressed Metal Institute, 3673 Lee Rd., Cleveland 20. Nominees should be persons who have made major contributions to the advancement of the metal stamping industry. Winners will be awarded a trip to next year's PMI meeting in Bermuda. The Presteel Award was established by Worcester Pressed Steel Co. in commemoration of the company's 50th Anniversary.

SAM Elects President . . .

● Homer E. Lunken has been elected national president of the Society for Advancement of Management. He is vice president and a director of Lunkenheimer Co. of Cincinnati, Ohio.

Name Change . . .

● A•S•R Products Corp. is the new name for American Safety Razor Corp. The company's program of diversification is responsible for the change. Once primarily identified with shaving equipment and accessories, its products now include drill attachments, military ordnance, and textile machinery.

Increase in Machine Tool Shipments . . .

● Machine tool shipments for the first quarter of 1957 were $244,100,000, which is a $50,750,000 increase over the same period in 1956. However new orders were considerably lower than those for the first quarter of last year—$181,450,000 as compared to $280,350,000. At the present time, the machine tool industry is operating with a backlog of approximately 5½ months. Although shipments will continue at a high rate throughout the year, they are not expected to reach the 1956 total of $886,150,000.

Patent Examiners Needed . . .

● The United States Patent Office needs engineers and scientists to serve as patent examiners. The announcement was made by The New York Patent Law Association, which points out that technically trained persons are being sought to evaluate applications for patents of new industrial products and processes. While there are openings in all areas, electrical engineers and electronics specialists are particularly needed.

Receives Edward P. Connell Award . . .

● George H. Acker is the 1957 recipient of the Edward P. Connell Award presented by the American Gear Manufacturers Association. This award is given to an individual who has made outstanding personal contributions to further the art of gearing. Mr. Acker is president of The Cleveland Worm and Gear Co.

The Scintilla Division of Bendix Aviation Corp. has received its fifth Civil Defense plant protection award. The citation is given to a plant which has established and maintained organizations and facilities in line with CD recommendations for the protection of workers and property in an emergency. Scintilla is the first New York plant to win five such awards.

◆

Dixie Cup Co. has merged with American Can Co. Dixie is the country's leading producer of paper food and drinking cups, as well as the designer and producer of its own manufacturing equipment.

◆

Victor Adding Machine Co. has acquired an automatic screw machine plant. The firm has taken over the entire facilities and operation, including a full complement of skilled workers, of Lander Mfg. Co., a former Victor supplier. As a result of the purchase, Victor will now produce its own screw machine parts for use in its calculators, adding machines, and cash registers.

◆

Sunnen Products Co. recently celebrated its 30th Anniversary of incorporation. The company manufactures precision honing equipment for industry and automotive engine rebuilding equipment.

◆

A West Coast Division office has been opened in Los Angeles by S & S Machinery Co. It will service the company's customers in the Pacific and Mountain states. Manager of the new branch is Charles Schaeffer.

◆

Gredag, Inc., a division of Acheson Industries, Inc., has transferred its sales activities to Acheson Colloids Co., an affiliate division. All business transactions related to the sale of Gredag greases, and oil and synthetic lubricants will be carried on as the Gredag Department of Acheson Colloids, located in Port Huron, Mich.

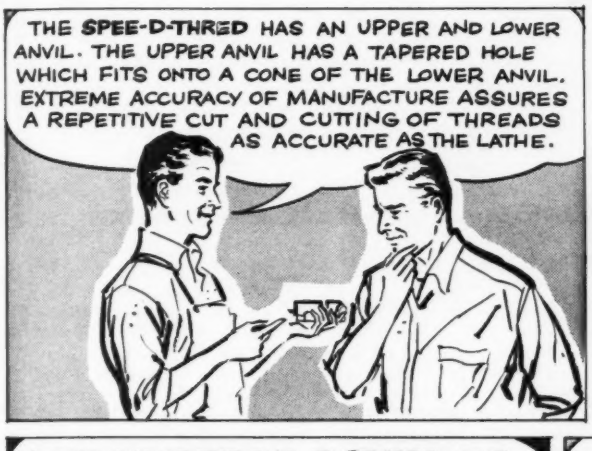
◆

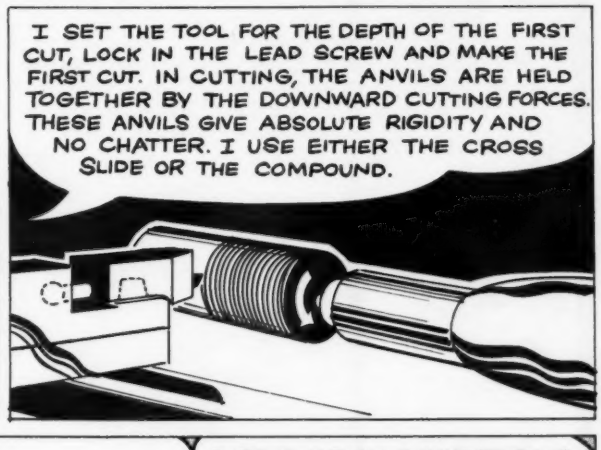
Vacuum Forming Corp. recently became a part of Emhart Mfg. Co. Key personnel of the former company are with Emhart's Henry & Wright Division in Hartford, Conn., where the VacForm and Vac-Trim line is now manufactured.

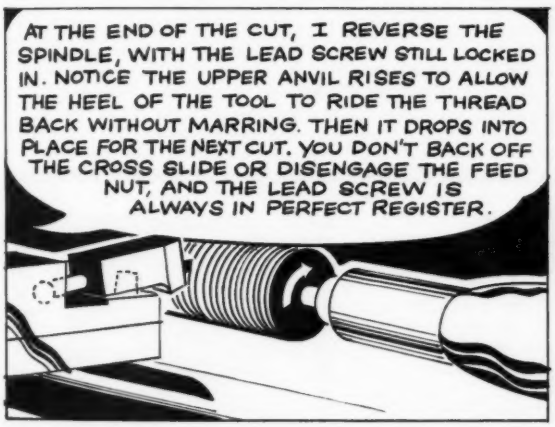
Bill Proves . . .

You Can Single Point Thread On A Reversible Lathe In Half The Time With A Spee-D-Thred

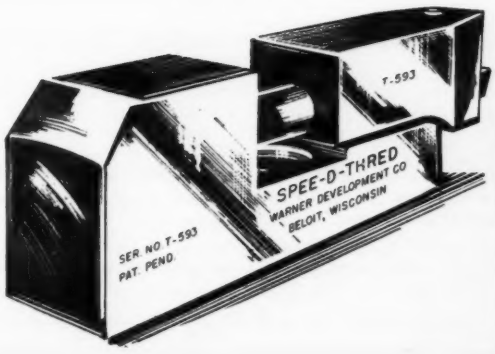
SAY BILL, HOW DO YOU FINISH THOSE SINGLE POINT THREADING JOBS SO FAST?
THAT'S EASY, JOE. I USE A SPEE-D-THRED. IT CUTS THREADING TIME 50 TO 70%... AND MAINTAINS ACCURACY TOO.


THE SPEE-D-THRED HAS AN UPPER AND LOWER ANVIL. THE UPPER ANVIL HAS A TAPERED HOLE WHICH FITS ONTO A CONE OF THE LOWER ANVIL. EXTREME ACCURACY OF MANUFACTURE ASSURES A REPETITIVE CUT AND CUTTING OF THREADS AS ACCURATE AS THE LATHE.


I SET THE TOOL FOR THE DEPTH OF THE FIRST CUT, LOCK IN THE LEAD SCREW AND MAKE THE FIRST CUT. IN CUTTING, THE ANVILS ARE HELD TOGETHER BY THE DOWNWARD CUTTING FORCES. THESE ANVILS GIVE ABSOLUTE RIGIDITY AND NO CHATTER. I USE EITHER THE CROSS SLIDE OR THE COMPOUND.


AT THE END OF THE CUT, I REVERSE THE SPINDLE, WITH THE LEAD SCREW STILL LOCKED IN. NOTICE THE UPPER ANVIL RISES TO ALLOW THE HEEL OF THE TOOL TO RIDE THE THREAD BACK WITHOUT MARRING. THEN IT DROPS INTO PLACE FOR THE NEXT CUT. YOU DON'T BACK OFF THE CROSS SLIDE OR DISENGAGE THE FEED NUT, AND THE LEAD SCREW IS ALWAYS IN PERFECT REGISTER.

IT SURE SOUNDS EASY AND THE SPEED IS GREAT!
SURE IS JOE, ALL I HAVE TO DO IS REVERSE THE LATHE AND I CAN'T SPOIL ANY WORK FROM CROSS THREADING. NO THREADING DIAL TO WATCH SO I CAN CUT FAST.
WRITE FOR OUR FREE BROCHURE ON SPEE-D-THRED TODAY



Spee-D-Thred

WARNER DEVELOPMENT CO.

MAKERS OF HIGH SPEED THREADING TOOLS FOR LATHES

South Beloit, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 45

DROODLES

by ROGER PRICE

Bench Model BC-7C

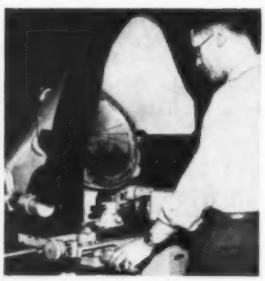
Floor Model FC-30

Floor Model FC-14

"MIRROR FINISH"

Just looking at this mirror brings back the smell of grease paint and my uncle Lester, the vaudevillian. What a ham! When I was eleven, I assisted him in his magic act on the Burkett circuit. First I'd walk on in my Buster Brown suit, holding a card that read "The Renowned Lester, Master of Marvels". Then I'd help him by letting him break eggs on top of my head, and things like that. The climax of our tour came the night Lester added a little twist to his disappearing act — he caused himself and the box-office receipts to vanish simultaneously. This earned him the longest run of his career . . . five years.

If *you're* interested in long runs — in a production sense, that is — you'll be intrigued by the Jones & Lamson Optical Comparator. This precision-built measuring and inspection instrument is invaluable for inspecting parts between operations. It is versatile, extremely rapid, and accurate to .0001". It detects flaws immediately, so scrap is kept to a minimum. The J & L Comparator is equally efficient on small-lot work, too, and helps maintain quality control in small plants and job-shops throughout the country. Available in eleven bench and pedestal models. For complete information, send this coupon *today*.

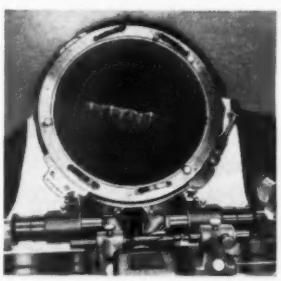


JONES & LAMSON
OPTICAL COMPARATORS *On the Job...*

Inspecting Precision Taps at
Jarvis Taps, Inc., N. Attleboro, Mass.

Magnified shadow outlines of tap forms are inspected at a glance, by comparison with a special tap outline chart. At the same time, lead is measured quickly and easily to .0001".

In another swift and sure operation, hook angles on cutting teeth are measured through the use of the J & L Reflection Attachment — on the same comparator.



"The originator of machine tool standards in optical inspection"

JONES & LAMSON

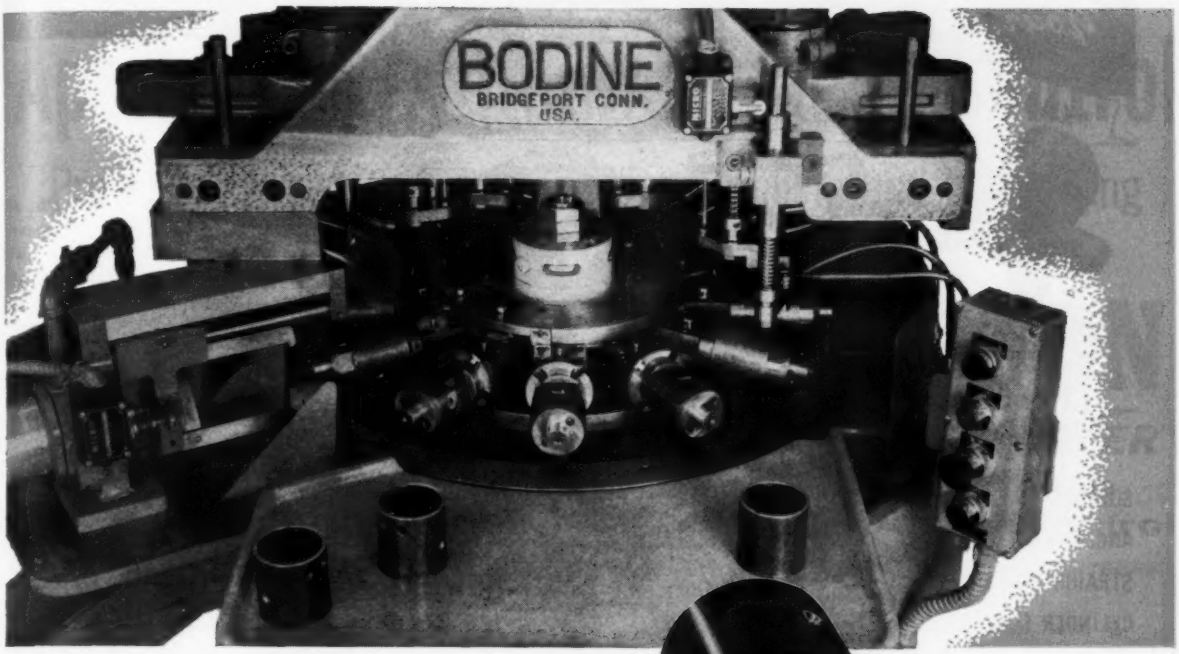
JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vt., U.S.A.
Please send me Comparator Catalog 402-C, which describes the complete line of J & L Optical Comparators.

name _____ title _____ street _____

company _____ city _____ zone _____ state _____

CIRCLE INFORM-A-GRAM KEY NO. 46

Bodine case history no. 44



1. Drill and countersink
2. Drill
3. Drill
4. Drill and countersink
5. Ejects stripping inside burr

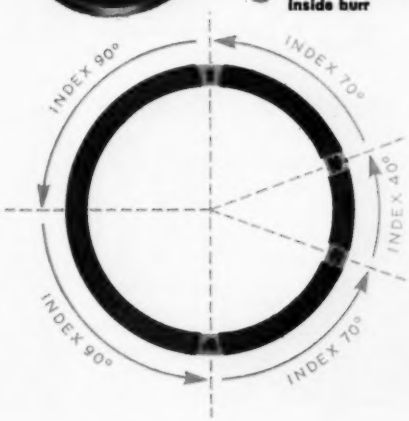
here's how the automakers streamlined small motor production on BODINES

This Bodine Case History is really only one of many closely related installations in the key auto-electrical plants. The fact is that essentially ALL the small motors that power windshield wipers, window lifts, heaters, seat adjusters, etc., on today's cars are made this way . . . and on Bodine machines.

Parts being made on this 42-30 Bodine are tubular motor frames. On the production line, tube sections are conveyor-fed and held as shown on horizontal automatic indexing fixtures. After machining, they are automatically ejected by the stripper mechanism shown at the left of the machine, while special carbide inserts designed into the fixture remove inside burrs.

In the photograph above, auto-loading conveyor and locking mechanisms have been removed to show tooling.

Simple, rugged Bodine VERTICAL tool spindles drill and countersink two holes and drill two additional holes through the walls of the tubing, as shown in the diagram . . . all accurate within close limits for position and angularity. The same machines can be quickly re-tooled for changes in motor sizes on yearly models. Similar Bodine machines (case histories on request) process the motor pole pieces, commutators, gear housings and end plates . . . Bodine speed and low-cost efficiency ALL the way.



PRODUCTION on this machine, with its specially designed electronic programming motor on the main drive to cut every second of idle time, is 675 pieces per 50-minute hour.

If you have a production job on which you, too, want to aim for an entirely new standard of cost-quality-volume efficiency, send drawings and samples to Bodine. Write Dept. TP-7.

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

3BD57

CIRCLE INFORM-A-GRAM KEY NO. 47

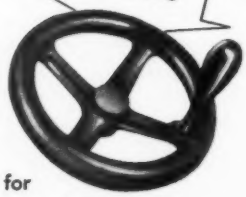
MACHINE PRODUCTS

Your Complete Line Source for . . .

KNOBS

LEVERS

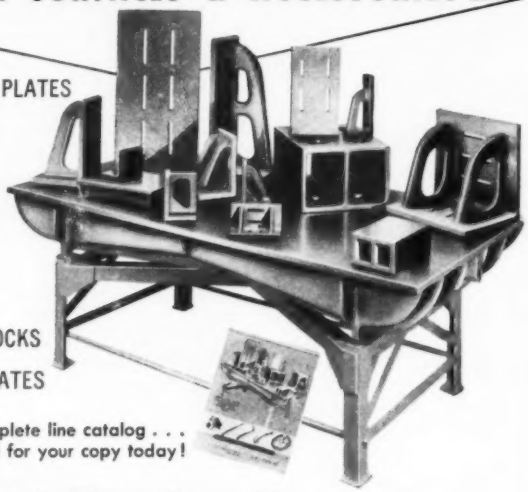
WHEELS & HANDLES



Cadmium plated and ready for immediate delivery in the style, size and quantity of your choice.

PRECISION SURFACES & ACCESSORIES

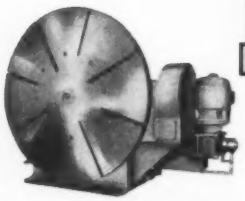
SURFACE AND LAYOUT PLATES
ANGLES • VEE BLOCKS
STRAIGHT EDGES
CYLINDER SQUARES
PARALLELS • CUBES
ALUMINUM ANGLES
ALUMINUM HEIGHT BLOCKS
ADJUSTABLE ANGLE PLATES

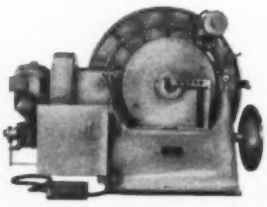


Free! Complete line catalog . . . send for your copy today!

Save Checking and Machining Time with

ROTAB *Rotary Tables*





Consider just a few of Rotab's many advanced engineering features. Parts can be rotated to any degree, adjusted to any angle from vertical to 30° below horizontal . . . no need, in most cases, for more than one set-up. Mechanical and optical setting systems are simple to use, easy to read and *highly* accurate . . . radial and angular settings can be measured *within 5* seconds of true position! In addition, motor-powered rotation and tilting facilitate fast, precise positioning.

Consider too, Rotab's versatility. It can be used for a variety of inspection and quality control operations . . . or for tool room machining. Get all the details. Write Machine Products today!

PRECISION ENGINEERED CHECKING AT ITS BEST!

MACHINE PRODUCTS *Corporation*

6771 E. McNICHOLS ROAD • DETROIT 12, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 48

People Are Important

by Erwin K. Taylor, Ph. D.
President
PERSONNEL RESEARCH AND DEVELOPMENT CORP.
Cleveland 20, Ohio

MORE EVALUATION CONTAMINATORS

FOR THE PAST SEVERAL MONTHS, this column has been exploring the problems and techniques involved in picking first line supervisors. In the June issue of *T & P* we talked about some of the major contaminating factors which distort our evaluations of candidates for supervisory positions. Evaluation contamination is so important that we feel justified in discussing it further. It is impossible, of course, to think of all the possible contaminating factors that *could* enter into a supervisory selection situation, but we can briefly discuss several additional categories of evaluation contaminators and explore the possibilities of avoiding them.

Personal Bias

It is almost impossible to avoid allowing our personal feeling to enter into what should be a completely objective evaluation. It is equally impossible for any person to work with or supervise the work of another and not develop subjective reactions — likes or dislikes for him. These likes and dislikes invariably color our reactions and our evaluations.

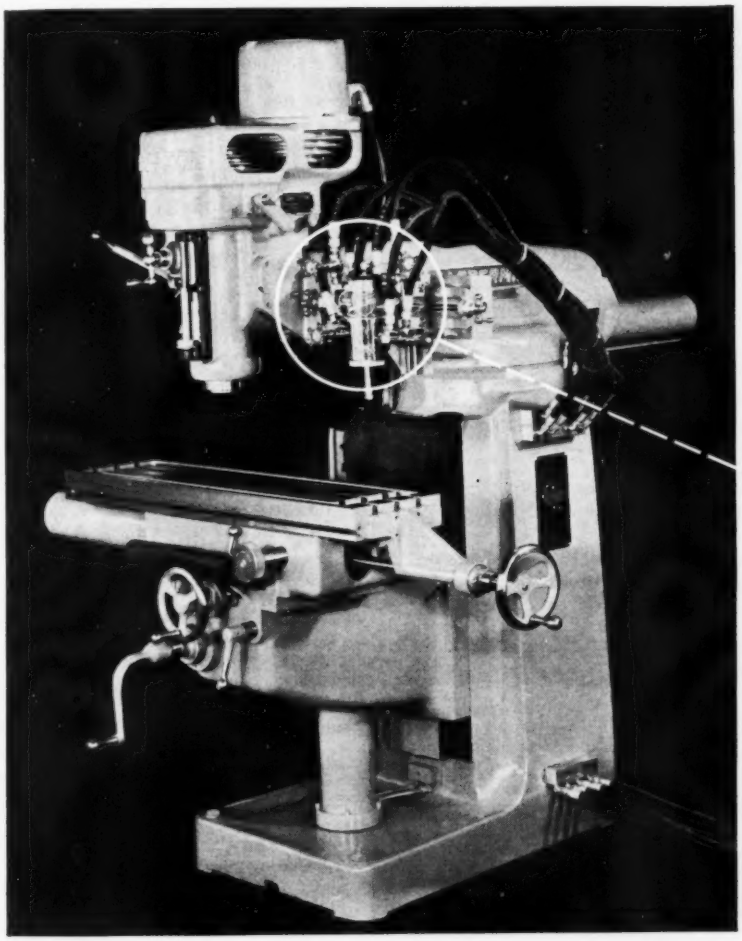
We must add parenthetically that personal bias is not always completely a contaminator. When a higher level supervisor is selecting someone whom he will train and work closely with, his own feelings toward the man are important determiners of the subordinate's success or failure. When the evaluator will have little contact with the man selected, his feelings toward the man will be unrelated to the latter's success.

We may mildly like or dislike a person, or we may have rather strong feelings in either direction. Obviously the stronger our feelings, the

. . . *Continued on Page 50*

Now "Micrometer Accuracy" Applied to Hydraulic Tracer Control

Provides more speed in Production Profiling and Duplicating



Gorton Trace-Master Hydraulic Tracer control is today's best unit for 2- and 3-dimensional duplication, production profiling and work on all types of die forging, die casting, metal stamping, embossing and coining, as well as plastic molds in both ferrous and non-ferrous materials.

GORTON

"TRACE MASTER" Supersensitive Hydraulic Control

This master control valve is manufactured to tolerances which are NEW in the field of hydraulics. Working parts are so delicately ground and lapped that they will operate only with a very fine grade of special oil. *Ordinary hydraulic fluids are wholly unsuitable.*

3 MODELS AVAILABLE

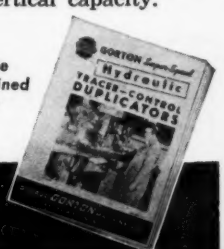
180° Vertical Hydraulic Feed to Knee.

360° Cross Hydraulic Feed to Ram and Longitudinal Hydraulic Feed to Table.

3D Hydraulic feed to knee, ram and table for 3-dimensional work.

The above can be furnished with the Gorton 1-22 Mastermil illustrated here or the Gorton 9-J Super-Speed Vertical Mill with single spindle, twin spindles and/or six inch higher column for additional vertical capacity.

Write for complete information contained in bulletin 2771–123/



GORTON

GEORGE GORTON MACHINE CO.

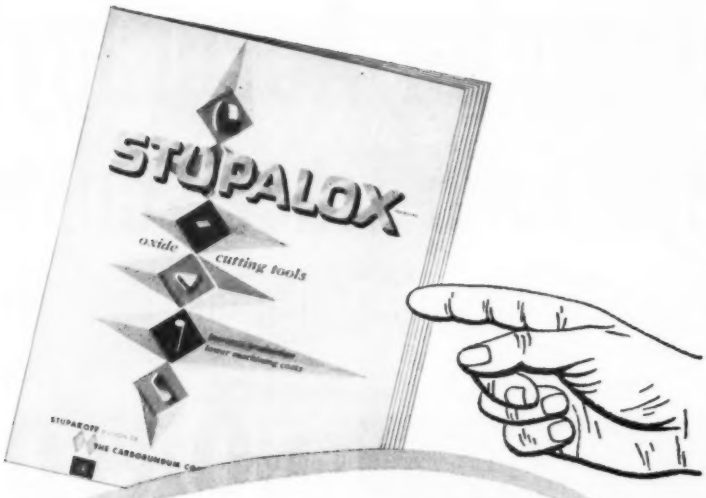
1207 RACINE ST. • RACINE, WISCONSIN

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A7-1002-1P

CIRCLE INFORM-A-GRAM KEY NO. 49



New data tells how

STUPALOX ***oxide cutting tools***
cut costs...
speed production!

Now at last! In a handy, well-organized booklet for easy reference—facts, figures and other technical data on the complete line of Stupalox oxide cutting tools and holders.

The amazing performance of these tools—developed by Stupakoff engineers—has established new highs in production and profits for users. They have brought about a new era in cutting tool performance. Faster speeds, deeper cuts, smoother finishes, and longer tool life add up to greater over-all economy. Even capital investment can be lowered, since production levels can be maintained with fewer machines and floor space released for other uses.

This new booklet contains all of this valuable information on one of the most exciting developments in the machine and tool industry during recent years. For your free copy, fill out and mail the coupon below.

STUPAKOFF DIVISION OF
The CARBORUNDUM Company

WRITE DEPT. TP 15 LATROBE, PENNSYLVANIA

SEND *for your FREE copy TODAY!*

Stupakoff Division of
The Carborundum Company
Latrobe, Pennsylvania

Please send me a free copy of Bulletin 257, STUPALOX OXIDE CUTTING TOOLS

NAME_____ TITLE_____

STREET_____

CITY_____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 50

. . . Evaluation from Page 48

greater their effect upon our evaluation. When we are evaluating a man for a supervisory position we need to ask ourselves, "How much do I like or dislike this man?" When we find that we have rather strong feelings positive or negative, we need to proceed cautiously. We must ask ourselves, "To what extent have my feelings toward this man colored the facts upon which his evaluation is based?" The answer to this question is not easy to come by. Our emotions play nasty and subtle tricks on our minds. One way of course, is to get independent evaluations from other individuals who have been in a position to observe the man.

An additional way is to sit down and systematically record the evidence on which your evaluation is based. After you have written all of the things that substantiate your evaluation, go back and review his performance over the past six months and see how much evidence you can collect that contradicts your evaluation. Everybody has strong points and weak ones. But it is only natural to focus on one or the other of them. If you find no contradictions, you can be pretty sure that your feelings toward the man have played a determining role in your evaluation. If you make an honest effort to evaluate objectively, you will surprise yourself by the amount of contradictory evidence you find.

We frequently assess men for supervisory and managerial positions in our clients' organizations. In reporting the results of such assessments, I have frequently noted that much of what we tell our clients about these men they should already know but refuse to see. In many cases our greatest value has been to force our clients to remove their emotional blindfolds and more objectively examine the facts.

Reputation Bias

One of the questions in the Stanford-Binet Intelligence Test, used primarily with children, is to ask the subject to differentiate between "reputation" and "character". While all of us *know* this difference, we do not always use this knowledge in making supervisory selections. We do not always take the trouble to look behind a man's reputation and determine what it is based upon. Sometimes it has no firmer foundation than the casual remark of a member of top management. The plant manager might say to the general foreman, "That new man in Heat Treat looks like a good, hard worker." The remark gets passed down the line with the usual distortions common to such communications and the next thing you know the new man in Heat Treat is looked upon as a "comer". The opposite kind of reputation can

. . . *Continued on Page 52*

Miller

Sales and Service from Coast to Coast

. . . for quick, personalized service on your POWER CYLINDER NEEDS

Over 100 Miller Field Engineers . . . factory trained . . . fully experienced . . . specially qualified to render helpful, friendly cooperation from the strategic locations listed below.

Red areas indicate extent of Miller sales and service coverage. Black stars indicate district headquarter locations.

ALABAMA

Birmingham—Miller Fluid Power Power Div., 1925 29th Ave. S. Phone Tremont 9-6601

CALIFORNIA

San Francisco—Miller Fluid Power Div., 561 Buckingham Way. Phone Montrose 4-3531

Los Angeles—Teglen Engineering Co., P. O. Box 191, S. Pasadena. Phone Ryan 1-2856

COLORADO

Denver—Alta Engineering Co., 1988 Nome St. Phone Empire 6-3557

CONNECTICUT

Hartford—Gibson Engineering Co., 141 Washington St. Phone Chapel 7-6919

GEORGIA

Atlanta—Miller Fluid Power Div., 254 East Paces Ferry Rd., N.E. Phone Cedar 7-9933

KANSAS

Kansas City, Mo.—Miller Fluid Power Div., 410 West 40th Terrace. Phone Valentine 1-7475

ILLINOIS

Chicago (Home Office) — Miller Fluid Power Div., 2040 N. Hawthorne Ave., Melrose Park, Ill. Phone Fillmore 3-4500

Rockford—Miller Fluid Power Div., 4712 Cayuga. Phone Rockford 7-1308

INDIANA

Fort Wayne—Neff Engineering Co., 2339 Crescent Ave. Phone Eastbrook 7391

South Bend—Neff Engineering Co., 103 S. Varsity Drive. Phone Central 2-4856.

Indianapolis—Neff Engineering Co., 6101 College Ave. Phone Clifford 5-5418-19

IOWA

Miller Fluid Power Div., 916 25th St., Moline, Ill. Phone Moline 2-4282

KENTUCKY

Louisville—Charles Weber Co., 536 Eastern Parkway. Phone Melrose 7-2574

MARYLAND

Baltimore—Miller Fluid Power Div., 1515 Kirkwood Rd. Phone Ridgeway 7-9424

MASSACHUSETTS

Boston—Gibson Engineering Co., 1018 Commonwealth Ave. Phone Aspinwal 7-5074

MICHIGAN

Detroit—Miller Fluid Power Div., 7338 Woodward Ave., Rm. 404. Phone Trinity 2-1441

Grand Rapids—J. N. Fauver Co., 2147 Englewood Drive. Phone Cherry 5-1247

Flint—J. N. Fauver Co., G. 3140 E. Hemphill Rd. Phone Pilgrim 2-3300

MINNESOTA

Minneapolis—Miller Fluid Power Div., 2800 Foshay Tower. Phone Federal 5-0449

MISSOURI

St. Louis—Sturgis Equipment Co., 601 S. Taylor Ave. Phone Olive 2-5380

NEW YORK

New York City—C. H. Ribble Co., 31 Di Carolis Court, Hackensack, N. J. Phone Diamond 2-2602

Rochester—Miller Fluid Power Div., 114 Thistledown Dr. Phone Congress 6-1660 or Browning 1-2109

Buffalo—Miller Fluid Power Div., 28 Church St. Phone Madison 3993

OHIO

Akron-Youngstown—Miller Fluid Power Div., P. O. Box 150, Sebring, Ohio. Phone Sebring 8-6368

Cleveland—Miller Fluid Power Div., 12703 Triskett Rd. Phone Clearwater 2-3131

Dayton—K. C. Mosier Co., 628 Ludlow. Phone Michigan 9805

Columbus—K. C. Mosier Co., 549 N. Columbia. Phone Capital 1-7120

Lima—K. C. Mosier Co., 1566 N. Union. Phone 6-8616

Cincinnati—K. C. Mosier Co., 6119 Cary. Phone Garfield 1-1023

Toledo—J. N. Fauver Co., R.F.D. Dutch Road, Waterville, Ohio. Phone Waterville 3598

PENNSYLVANIA

Philadelphia—Miller Fluid Power Div., 1468 York Rd., Abington, Pa. Phone Turner 4-4905

Pittsburgh—Ralph Hiller Co., 4133 Brownville Rd. Phone Tuxedo 2-7353

TEXAS

Houston—Hydraquip Corp., 6645 Navigation Blvd. Phone Walnut 6-8301

WASHINGTON

Seattle—George W. Warden Co., 1305 Dexter Ave. Phone Alder 0622 or Adams 0150

WISCONSIN

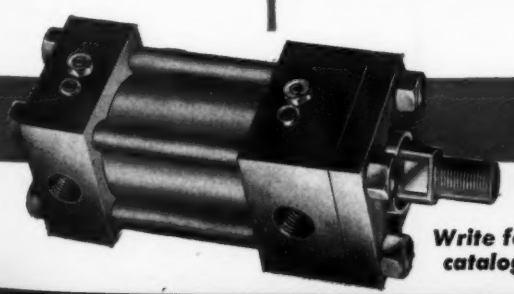
Milwaukee—Fluid Power Equipment Co., 3320 Green Bay Ave. Phone Concord 4-0046

QUEBEC, CANADA

Montreal—Miller Fluid Power Div., 520 Curzon St., St. Lambert, Montreal. Phone University 1-1304

ONTARIO, CANADA

Toronto—Miller Fluid Power Div., 4158 B. Dundas St. Phone Belmont 3-0831



Write for catalog

Miller · FLUID POWER DIVISION
Flick-Reedy Corp.

2046 N. Hawthorne Avenue MELROSE PARK, ILLINOIS

AIR & HYDRAULIC CYLINDERS · BOOSTERS · ACCUMULATORS
COUNTERBALANCE CYLINDERS

PRECISION PRODUCTION PROBLEMS ?

Here's help from Bausch & Lomb in TOOL DESIGN INSPECTION FABRICATION MEASURING TESTING

NEW! ALIGNMENT INTERFEROMETER

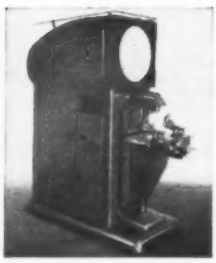
Accurately measures small changes in angle over a range of 30 seconds of arc (±15 seconds). Easy direct scale readings to 0.2 seconds (0.000006″).

BENCH COMPARATOR

Exclusive understage illumination—no complex set-ups, no holding fixtures for most work. Magnified silhouettes show errors instantly. Reads to 0.0001″ with optional micrometer stage.

STEREO-MICROSCOPES

Magnified 3-D views of tiny parts. Dustproof, shockproof, can be mounted right in machine or fixture. Speeds assembly, inspection. Most complete line, widest field of view.

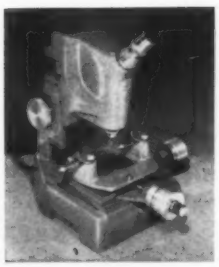


CONTOUR MEASURING PROJECTOR

Shows magnified silhouettes or surface views. Simple operation, highest precision measurements: to 0.0001″, linear; to 1 minute of arc, angular.

OPTICAL AIDS CATALOG

Time-and-money-saving data on Surface Comparators, Industrial Magnifiers, Macroscopes, Microscope Bodies, Micrometer Discs, Wide Field Tubes, Brinell Microscopes, Shop Microscopes.



NEW TOOLMAKER'S MEASURING MICROSCOPE

Quickly measures opaque or transparent objects of any contour. Linear, accurate to 0.0001″; angular, to 1 minute of arc.

MAIL COUPON TODAY FOR VALUABLE DATA

BAUSCH & LOMB OPTICAL CO.
79819 St. Paul St., Rochester 2, N. Y.
Please send literature on optical production aids checked below:
☐ Alignment Interferometer ☐ Bench Comparator ☐ Contour Measuring Projector
☐ Toolmaker's Microscope ☐ Stereomicroscopes ☐ Optical Aids Catalog

NAME .....
TITLE .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

BAUSCH & LOMB
SINCE B&L 1853

CIRCLE INFORM-A-GRAM KEY NO. 52

. . . Evaluation from Page 50

be just as easily established and on equally flimsy grounds. While we strongly recommend the use of multiple evaluations, it is important that all of the evaluations be independent and not merely achoes of unfounded rumors or voiced biases.

Isolated Incidents

The evaluation of a worker to be valuable must be representative of his usual manner of behavior. But the way a man performs on a day-to-day basis is frequently overshadowed by a dramatic occurrence which lives long in the memory of his superior. A competent and conscientious worker may pull a "boner" which may dun him for years, interfere with his career, and deprive the company of a good supervisor. Conversely, a mediocre worker may get a "flash in the pan" idea which calls him to management's attention. It may even win for him an unearned promotion to a supervisory position for which he is totally unfit. The relationship of a dramatic incident to reputation bias is a close one, since many a reputation is built on unusual rather than typical performance.

Whenever we are evaluating a man for promotion to a supervisory position, we need carefully to examine the foundation of our evaluation. Is it truly the reflection of this man's level of performance — his day-to-day working habits — or is it unduly affected by a couple of isolated incidents? Again the only way to find out is to systematically list the basis of your evaluations and to examine the list critically to see if it is truly representative of the performance of the man.

Popular Superstition

You would think it unnecessary in this age of enlightenment to bring up the topic of the pseudo-sciences in a discussion of the evaluation of workers for supervisory positions. Unfortunately, the dark ages still cast their shadows on our thinking. It is indeed an unusual metropolitan daily newspaper that does not carry an astrology column, and while few managements consult the stars in selecting supervisors, there are still a number of equally unfounded superstitions that consciously or unconsciously influence our evaluations of people.

So deeply ingrained are some of these superstitions that they have become a part of our daily language and we continue to refer to people as "high-brows or low-brows", as having a "determined jaw" or "shifty eyes". We are inclined to believe that all stout men are jolly while tall, thin ones are inclined to be cantankerous. All these are hangovers from man's endless effort to find a simple and easy way to classify his fellow beings. By this time we should have learned that there is none. But like

. . . *Continued on Page 56*

"A new press just wasn't in the cards...

so we rebuilt this one and saved ourselves a lot of money!" And it can be done with any Bliss press. Bliss has developed 42 modernization "packages"—pre-engineered assemblies—all you need to make an old press act young again. Add faster clutches, modern adjustments, more compact gearing, greater capacity. Do it in *your* own plant to keep downtime at a minimum. Or have Bliss do a complete rebuilding job for you.

Which is better? It's up to you. We'll give you the facts, but it's up to you. For here at Bliss, we consider the sale but the beginning of our responsibility. Which is what we mean when we say, "Bliss is more than a name... it's a guarantee."

BLISS
SINCE 1857

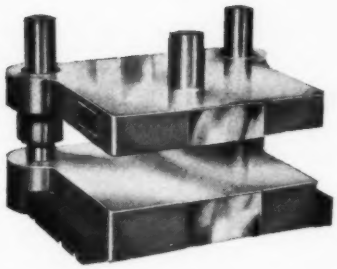
E. W. BLISS COMPANY · Canton, Ohio

100 years of making metal work for mankind

PRESSES • ROLLING MILLS • ROLLS • DIE SETS • CAN MACHINERY • CONTRACT MFG.

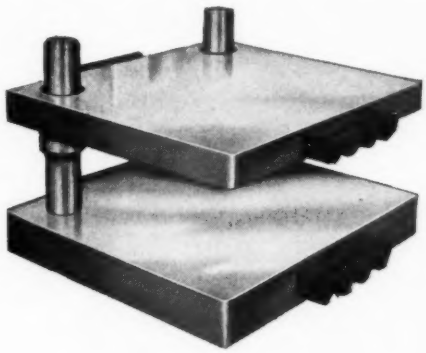
CIRCLE INFORM-A-GRAM KEY NO. 53

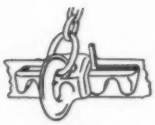
HANDLE LARGE AND SMALL DIE SETS SAFER·FASTER·MORE EFFICIENTLY



ONLY SUPERIOR *precision all steel*
DIE SETS *offer exclusive safety and handling features.*

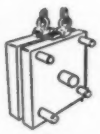
Three features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment. **In addition, all Superior Die Sets are jig bored to your specifications — result number of sizes practically limitless.** Write for FREE 24 page Catalog on Superior Die Sets and Supplies.



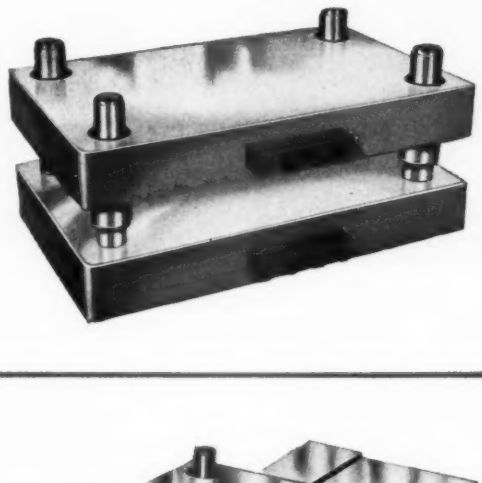


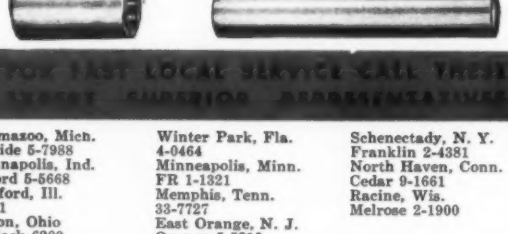
LOCK-JAW LIFTING DEVICE removes the danger of handling large die sets.

SAFETY FLANGE protects fingers by providing roomy gripping space on either side of the die shoe.



E-Z LIFT SLING CHAIN attach to the lock-jaw for immediate lifting.



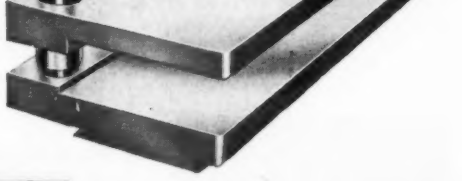


FOR FAST LOCAL SERVICE CALL THESE NEAREST SUPERIOR REPRESENTATIVES

Kalamazoo, Mich. Fireside 5-7988
Indianapolis, Ind. Clifford 5-5668
Rockford, Ill. 3-3931
Dayton, Ohio Hemlock 6209
Chicago, Ill. Randolph 6-8871
St. Louis, Mo. Jeff 5-1223
Dallas, Texas Riverside 5138
Winter Park, Fla. 4-0464
Minneapolis, Minn. FR 1-1321
Memphis, Tenn. 33-7727
East Orange, N. J. Orange 5-5810
Denver, Colo. Enterprise 234
Agawan, Mass. Republic 9-1132
Madison, N. J. Frontier 7-0407
Schenectady, N. Y. Franklin 2-4381
North Haven, Conn. Cedar 9-1661
Racine, Wis. Melrose 2-1900

Plants at

Milwaukee, Wis. Mitchell 5-6027
Plainville, Conn. Sherwood 7-2761



SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

MULTI-SLIDE SETS TO YOUR SPECIFICATIONS

CIRCLE INFORM-A-GRAM KEY NO. 54

Don Oberg tells why the Moore Jig Grinder is an absolute must in any good die shop

by **DON E. OBERG**
General Manager
Oberg Manufacturing Co., Inc.
Tarentum, Pa.
Largest Manufacturer of
Carbide Dies

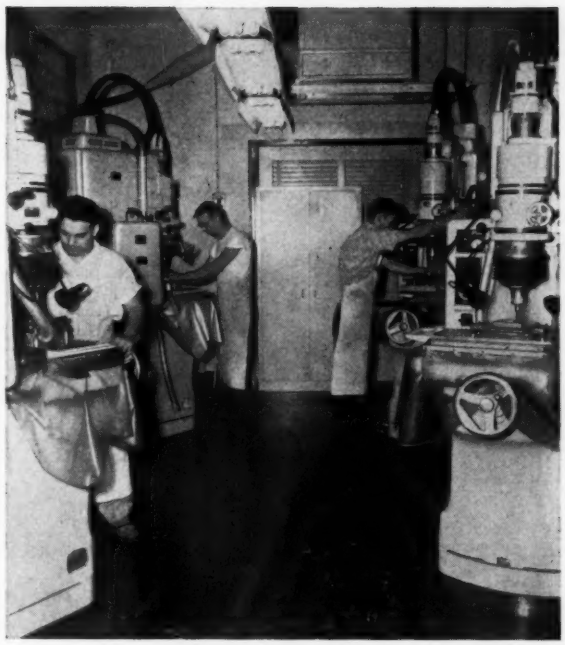
"One of the most important features of an Oberg-built die is guaranteed complete and positive interchangeability of parts throughout the life of the die. *This feature would be practically impossible without the application of Moore Jig Grinders.*

"With Moore Jig Grinders we can accurately locate holes with relation to each other as well as size holes to extreme accuracies. We can efficiently grind contours on carbide die sections which would be impractical by almost any other method. Back taper on contoured carbide die sections and piercing holes can be readily generated on Moore Jig Grinders.

"We feel it would be *practically impossible* to produce the high precision carbide dies required by industry today without the Moore Jig Grinder. *In our opinion it is an absolute must in any better-than-average die shop.*"

As Mr. Oberg points out, the Moore Jig Grinder has no equal on many essential toolroom operations. If you would like a bulletin describing some of the features that make this machine so outstanding, just drop us a line.

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut



"The things we like best about our four Moore Jig Grinders are the sturdiness and dependable long-life accuracy built into them. Ours are used ten hours or more every day. Even with this high activity, we have found no apparent inaccuracies from our oldest to our newest machine."

HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U. S. A., $6 elsewhere.

ADD MOORE TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 55

Makes tough ones *EASY* —and easy ones *SURE!*

THE PROFILOMETER® makes it easy to measure the roughness of nearly *all* machined and finished surfaces, no matter where they are located. It *shows* the roughness, on a meter, in standard *microinch units.* And it gives *consistent, accurate readings* for any surface from polished glass to rough-machined forgings — regardless of the place, the time, the operator, or the equipment used.

As you can see, the Profilometer is a SHOP TOOL, and can be used wherever desired. It is fast and simple to operate (needs no special skill or experience) — is built for hard service — and is reasonably priced. It is *standard equipment* in *thousands* of production and inspection departments, throughout the world.

FREE ILLUSTRATED BULLETIN gives details, and describes *cost-saving applications.* Write for it!

OTHER MICROMETRICAL PRODUCTS include the PROFICORDER® (for obtaining magnified surface profile records); WAVOMETER® (for measuring waviness around surfaces of rotation); ANDEROMETER® (for measuring the over-all quality of assembled ball bearings). Illustrated bulletins on request.

Representatives in principal industrial centers throughout the Free World

Names of above products are registered trade-marks.

MMC MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 56

. . . Evaluation from Page 52

the alchemist of old, seeking the magic formula that would turn base metals into gold, there are still those in management who refuse to recognize the complexity of the human being and, in their effort to predict future performance, are too easily led or rather misled into embracing some discarded superstition either in its original garb or dressed up with scientific sounding names.

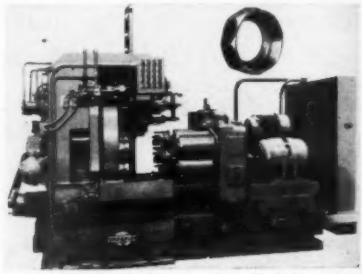
Enough of Contamination

We could go on and on to discuss a hundred and one different minor sources of evaluation contamination but we have already belabored the point. Suffice it to say that it is practically impossible to eliminate completely evaluation bias. To the extent that it can be minimized by an objective examination of the basis of the evaluation, the selection made will result in better supervisory performance.

HORIZONTAL INDEXING MACHINE BUILT FOR MACHINE PIPE FITTINGS

This one-way, 5-station, horizontal automatic indexing machine was recently designed for high production machining of malleable-iron pipe fittings.

The parts are automatically loaded, four at a time, into the workholding fixtures at the 1st station by a magazine-type loading arrangement. They are then automatically indexed into the remaining four stations where the following machining operations are performed. Two diameters are combination bored, chamfered, and rough counterbored



in the 2nd station, and a finish counterbore and chamfering operation is performed in the 3rd station. The tapping operation is performed at the 4th station and the parts are automatically unloaded in the 5th station.

The machine, built by Greenlee Bros. & Co., is designed to handle a variety of five different sizes of pipe fittings, ranging from 1¼"-12 thread to 2"-14 thread at a gross production rate of between 576 to 712 pcs/hr, depending upon the size. To accommodate these different sizes the machine is equipped with interchangeable clamping fixtures, facilities for changing spindle speeds, and interchangeable lead-screw tap spindles for the different thread leads.

MAKE WESPO YOUR DESIGN STANDARD for ALL WORKHOLDING NEEDS

ASTE DATA SHEETS

WESPO TOGGLE CLAMPS & PLIERS

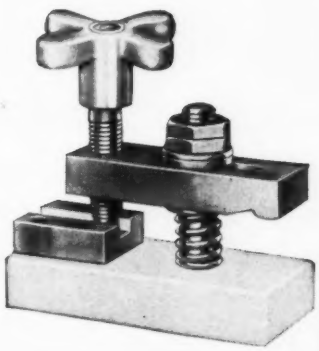
Over 80 types and sizes. From 5/8" Midget to 12 5/8" Clamp. PLIERS — from 1 5/16 Jaw Midget to 4 1/4 wide Jaw.

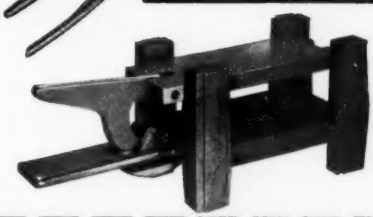
WESPO Toggle Clamps are made in types and sizes to meet all workholding needs, light, medium and heavy duty. Features include: REAMED HOLES, for better bearing, HARDENED BUSHINGS — SERRATED to prevent turning — HIGH TENSILE STRENGTH RIVETS for longer service.

WESPO FIXTURE CLAMPS

Over 170 Types and Sizes

WESPO fixture clamp assemblies save up to 70 percent on your own designing and machining. They are used as standard by a large number of leading manufacturers.





WESPO COMPONENTS

Over 1,000 types and sizes available from stock.

WESPO parts are precision manufactured of quality steel — heat treated and rustproofed. They are designed for heavy duty and long wear and have proved their value in many industries.

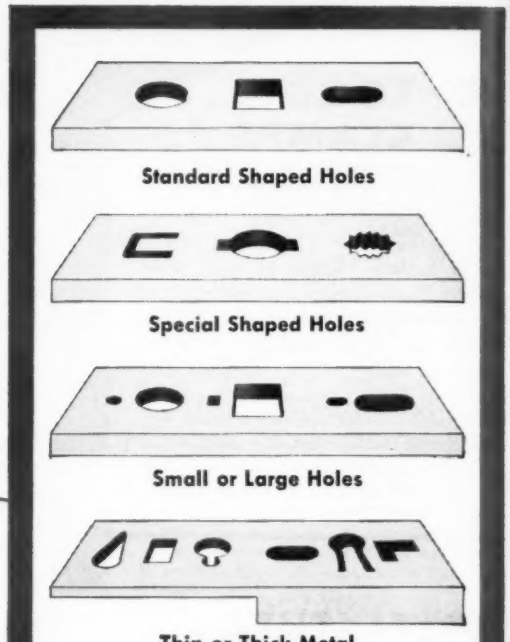
ADJUSTABLE SPINDLES FOR TOGGLE CLAMPS with BONDED NEOPRENE CAPS

Write for Catalogs —
TOGGLE CLAMPS & PLIERS, FIXTURE CLAMPS and PARTS

WEST POINT MFG. CO.
26937 W. 7 Mile Road • Detroit 19, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 57

WHEN R-B Punches Are Used



What are your piercing or forming requirements—standard or unusual shapes—small or large holes—steel or special alloys—thin or thick metals? Many hole-making applications, formerly requiring drilling or some other costly means, can now be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment.

No other manufacturer of punches and die buttons can offer you the amount of successful application experience and the scope of knowledge that is available from the R-B engineering staff for:

★ Cutting Your Production Costs

★ Reducing Die Designing Time

★ Increasing Productivity of Presses

★ Supplying Answers to Piercing Problems

★ Saving Die Construction Time

★ Complete Standardization of Press Tooling

For Additional Information or Engineering Service, Write to:

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 86 • 26476 CAPITOL AVENUE • DETROIT 39, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 58

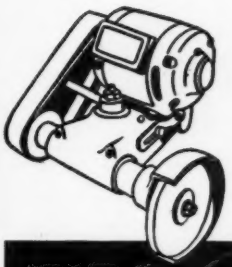
Simple, Easy Way to Do Spark Testing

Spark testing steel is a common occurrence in many steel warehouses, automotive plants and large stock rooms of industrial manufacturers. It is by this method that much of the steel used today is graded and selected for further processing.

One of the easiest ways to do this is to use a hand grinder. It is easy to handle, light in weight and powerful enough to throw a sufficient spark stream to instantly establish the grade of steel tested. Compact size makes storage no problem. Or, it might be used for other work, such as deburring, filing, smoothing weld seams, cleaning castings or for internal grinding.

The hand grinder used in the steel bin above is the Series 9, Dumore Hand Grinder. This handy tool was especially developed by Dumore to handle such plant jobs as spark testing. While it can be used for a great many other grinding jobs, its power-packed performance and perfect light-weight balance makes it ideal for this work. The ¼ hp fan-cooled, universal motor develops 15,500 rpm and swings ⅛" to 2-5/16" wheels. Extension arbor and ¼" chuck permit a wide range of work uses, both internal and external, with mounted wheels and burrs. Although powerful enough to handle the tough jobs, it weighs only 7½ lbs. For further information on this and other job-proved Dumore hand grinders for production, maintenance or tool room work, write to The Dumore Company, 1304 Seventeenth Street, Racine, Wisconsin.

Adv.

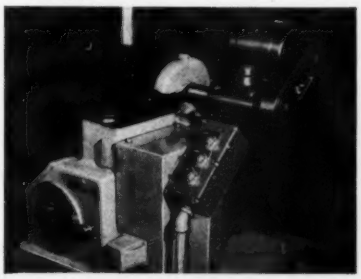


are you making the most of your DUMORE TOOL POST GRINDER?

VERTICALLY MOUNTED ON BRIDGEPORT MILLING MACHINE, a Dumore Tool Post Grinder provides an ideal high speed precision grinding head for use with small mounted wheels, points or carbide burrs.

MOUNTED ON UNIVERSAL GRINDER, a Dumore Tool Post Grinder finishes an internal section of a Jacobs chuck.

MOUNTED ON USED MILLER BASES, Dumore Tool Post Grinders provide a Chicago manufacturer with dependable high production, precision grinding equipment at an astonishingly low cost.



SPECIAL CUT-OFF MACHINE automatically sizes piston ring springs. Machine was easily made at low cost with a Dumore Tool Post Grinder to carry the cut-off wheel.

It mounts on *any* basic machine to provide low-cost, precision grinding equipment for production, maintenance or tool room needs!

Whenever precision of fit or finish is essential, and tooling cost is a vital factor, portable Dumore Tool Post Grinders will provide the complete answer. Lathes can be turned into external or internal cylindrical grinders. Planers, millers, and shapers can become surface grinders. Special grinding and cut-off machines can be built at amazingly low cost!

Simplified mounting is the secret of quick change-over—it also speeds re-converting to original set-up. Dumore Tool Post Grinders are continuous duty rated for high production. They consistently deliver precision to .0001" tolerances with surface finishes of 6 to 8 micro-inches. There's a complete line of nine models, ¼ to 3 hp, for every size of basic machine and type of grinding job.

Catalog 55 FL gives complete details, write for your copy.

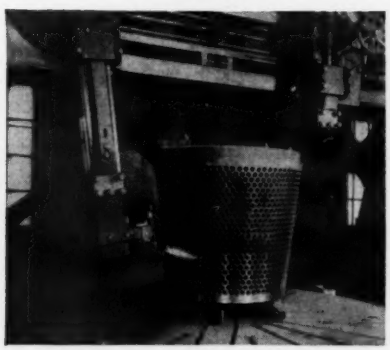
SOLD BY LEADING DISTRIBUTORS EVERYWHERE . . .

You can do more grinding with Dumore Grinders on **any** machine tool!

DUMORE
PRECISION TOOLS

1304 Seventeenth Street • Racine, Wisconsin

AUTOMATIC DRILL UNITS
TOOL POST and HAND GRINDERS
MICRO-DRILLS



MOUNTED ON RAM OF A BORING MILL, a Dumore Tool Post Grinder solves the tricky problem of grinding a high finish on perforated, tapered, cast-iron strainer cores.

CIRCLE INFORM-A-GRAM KEY NO. 59

V-B Liquid Honing*

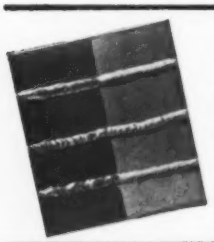
Your Way to Say:

"MOST MODERN PRODUCTION BLASTING EVER DEVELOPED!"

This Machine Should be Processing Your Parts

Vapor Blast Liquid Honing removes heat treat scale faster than conventional tumbling or any other process, and without pitting the steel.

Vapor Blast Liquid Honing blends out grind lines, as shown in the area to the left. The smooth, non-directional surface is ideal for oil flow and unequalled lubrication. Liquid-abrasive action also hones down tiny burrs along the edges of parts like this one.



This unretouched photo of three weld seams shows how efficiently you can remove mill scale, rust, welding and heat discolorations. Top weld is stainless steel; next, copper brazing; bottom, common steel.

For surface conditioning or finishing, a switch to Liquid Honing will save you a superintendent's pay in a year or less. Metals, plastics, ceramics — any material you use — can be Liquid Honed fast and to close tolerance. You get a better production job every time . . . at lower cost and without usual danger to the operator.

Send a sample scale-covered part with a letter describing your problem. Liquid Honing engineers will remove the scale and return the part with their recommendations. No cost to you . . . no obligation.

VAPOR V-B BLAST
MILWAUKEE, WISCONSIN

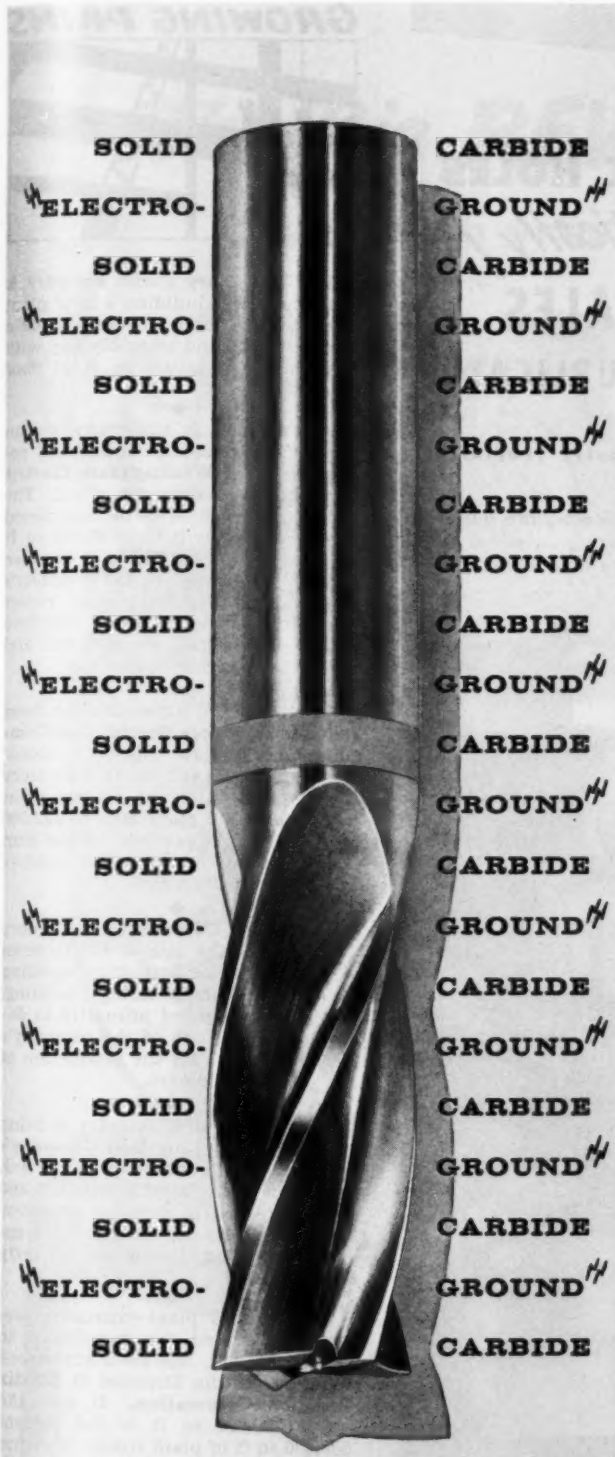
*Liquid Honing and Vapor Blast are trademarks.

DOLLAR FOR DOLLAR, JOB FOR JOB, NO OTHER SURFACE-CONDITIONING METHOD CAN EQUAL LIQUID HONING

VAPOR BLAST MFG. CO.

3131 WEST ATKINSON AVE. • MILWAUKEE 16, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 60



more

hours

of

useful

life

Elgin GOLDEN CIRCLE Carbide End Mills have sharp, smooth, hard cutting edges that LAST—and make your toughest jobs look easy! How come? First, they're solid carbide, of course. But most important, they are finished by Elgin's new Electro-Grind Process.

Electro-Grinding eliminates checked, chipped or flaked cutting edges caused by the strains and high temperatures of other production methods. With the extra fine grit wheels used by Elgin, Electro-Grinding assures the sharpest, smoothest cutting edges yet.

Use Elgin Golden Circle Carbide End Mills for more production hours between regrindings, for greater accuracy and lower tool costs. Write today for the complete new catalog. It shows Elgin's complete line of solid carbide end mills, drills, reamers and burs—all in stock for immediate delivery.

Abrasives Division
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS

DEPT. D.

ELGIN "Electro-Grinding" Makes the Most of Solid Carbide

CIRCLE INFORM-A-GRAM KEY NO. 61

DUPLICATE HOLES
Automatically!
WITH THE WALES
FABRICATOR-DUPLICATOR

PUNCH ACCURATE HOLES FROM ANY MASTER TEMPLATE!

Holes in the template, mounted on the Duplicator, are automatically precision punched in the work piece . . . which is mounted on the Fabricator. Any size or shape hole within the limits of 3½" dia. can be handled on a quick change basis. Punch and die changes are made in seconds so that patterns with various size holes can be duplicated at high speed. This equipment is a complete punching shop in itself . . . fast . . . accurate . . . rugged and priced within the reach of any shop.

WALES MOBILE FIELD UNITS
We'll bring the Fabricator-Duplicator right to your door for a demonstration. Ask for details.

SEND FOR BULLETIN NO. 27F
Time studies, specifications illustrations etc., are all yours for the asking.

WALES *Strippit* COMPANY
"...the Wales-Way is the PLUS-PROFIT way"
AKRON, NEW YORK
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

CIRCLE INFORM-A-GRAM KEY NO. 62

GROWING PAINS

The Waterbury Farrel Foundry & Machine Co. is building a new plant in Cheshire, Conn. There will be a machine shop and assembly bay with approximately 50,000 sq ft of floor space.

◆

Construction is underway on an ultramodern manufacturing and repair plant for **Westinghouse Electric Corporation** at Compton, Calif. The building, which will be completed by November, will have 80,000 sq ft of plant area and 8,000 sq ft of office space. It will replace the company's present manufacturing and repair plant in Huntington Park. The firm repairs electrical equipment and produces electrical apparatus.

◆

A major plant expansion has been planned by **Moore Special Tool Company, Inc.** for late this year. Occupation of a 74,600 sq ft, two-story building adjoining the present plant will bring total plant area to 122,600 sq ft, making it possible for the firm to increase its machine tool production by more than 50%.

◆

Burroughs Corporation will more than double the size of its Tireman Avenue plant in Detroit by building a second manufacturing building. This plant, engaged primarily in defense work, is one of the company's major facilities for the production of electronic equipment.

◆

A new malleable foundry is being constructed at **Link-Belt Company's** Ewart plant in Indianapolis. It will incorporate the latest techniques and mechanization in foundry practices. The foundry is expected to be in operation during December or early January 1958.

◆

A $5,000,000 plant-expansion program scheduled for completion in stages by 1961, has been announced by the Scintilla Division of **Bendix Aviation Corporation.** It will add about 200,000 sq ft to the present 560,000 sq ft of plant space. The first phase of construction, a 11,000-sq-ft facility, has been completed, and work has begun on a 52,000-sq-ft addition designed for electrical connector manufacturing and related engineering and sales groups. The division will also build a new 15,000-sq-ft plating-waste disposal plant, to be completed by the end of next year.

The Big REVOLUTION

in punch press design...

is benchmaster's new ELECTRO-MAGNETIC CLUTCH!

Now available on 2, 5, 8 and 10-ton Benchmasters—all series

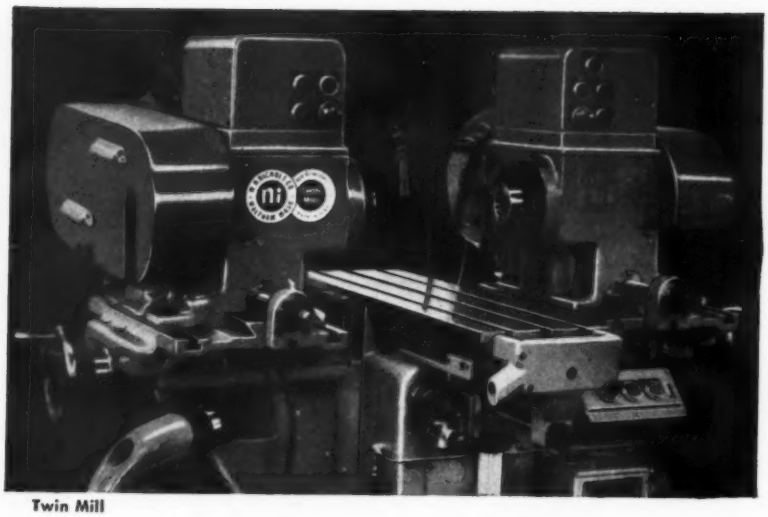
- Fully electro-magnetic operation
- Instant pickup or disengagement
- Maintenance-free
- No breakage hazards
- No sliding keys or dogs
- No mechanical linkage
- No airlines
- Smooth, relatively noiseless operation
- Positive brake
- Maximum safety

benchmaster

World's largest manufacturer of small punch presses and mills.

1835 W. Rosecrans Ave., Gardena, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 63



Twin Mill

NICHOLS MILLERS...

Ideal Basic Machines for Automatic Production

NICHOLS MILLERS are versatile, work-devouring machine tools, unexcelled in accuracy and fine workmanship.

Nichols BSA Semi-automatic

The TWIN MILL is practically TWO milling machines in ONE. Opposed Milling Heads have SIX-WAY adjustability for quick set-up and flexible approach to complex light milling operations. Push a button, and an automatic table cycle gives you TWO completed milling cuts. This unique duplex Miller is a cost-cutter without equal!

For high production precision milling where the double-barrelled approach of the TWIN MILL is not required, there are single spindle NICHOLS Semi-automatic Millers of varying work ranges. In addition to automatic table cycles, synchronized automatic downfeed of spindle head and automatic cross feeds are available.

NICHOLS MILLERS have a magnetic attraction for the Tool Engineer's ingenuity.

Write for literature and illustrations.

A NEW 16 mm. sound, color movie is available for free showing. May we reserve it for you?

Manufactured by **W. H. NICHOLS COMPANY**

National Distributors **THE ROBERT E. MORRIS COMPANY**

R E M SALES DIVISION
5007 FARMINGTON AVE. • WEST HARTFORD 7, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 64

Presenting . . . Representing . . .

Peaslee-Wells, Inc. of W. Springfield, Mass., has taken over as a distributor for Brush Electronics Co., division of Clevite Corp., handling the company's industrial equipment line.

•

The Seaboard Pacific Division of Associated Spring Corp. has appointed James A. Guyot as its representative in the San Francisco Bay area and the Pacific Northwest. He will headquarter at the newly opened sales office in Saratoga, Calif.

•

Clark Equipment Co. has named two new dealers to sell and service the fork-lift trucks, straddle carriers, and powered hand trucks produced by the Industrial Truck Division. They are Dues and Dueber, Inc. of Dayton, Ohio, and W. E. Johnson Equipment Co., Miami, Fla.

•

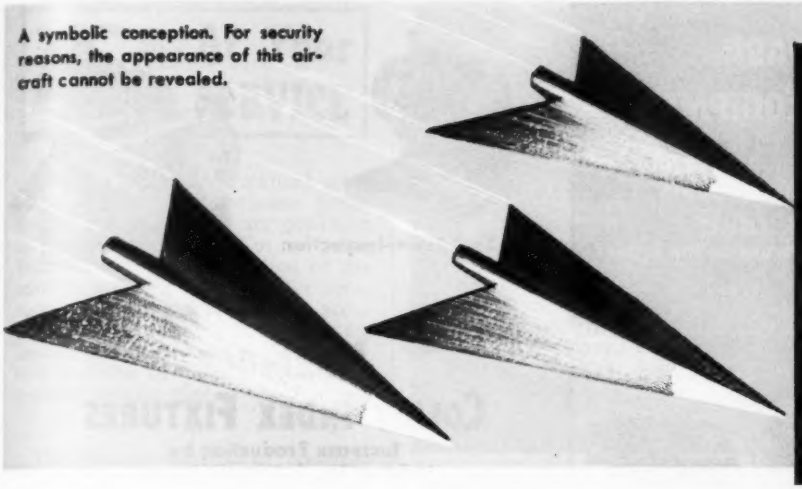
Tube Reducing Corp., Wallington, N. J., has announced the appointment of Industrial Products Sales, Inc. as sales agency for their rock-drawn tubing line. The new agency will cover Ohio, western Michigan, and northern Kentucky, with the main office in Akron, Ohio.

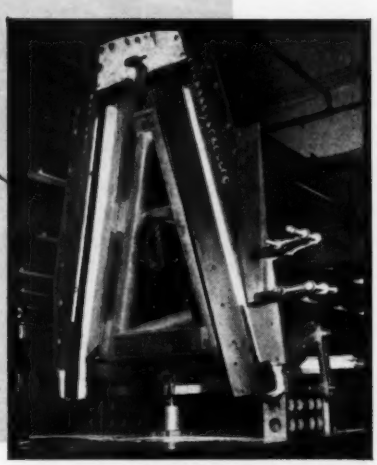
•

Henry Disston and Vulcan Crucible Steel Divisions of H. K. Porter Co., Inc. have appointed Cutting Tools, Inc. of St. Louis, Mo., as the distributor for their products in the St. Louis area. The company will handle the entire Disston product line, but will represent Vulcan only on Vulground precision-ground gage and die steel in air and oil hardening types. Carmel Engineering Corp. has become the exclusive distributor for Vulcan products in the central Indiana area.

•

Henry A. Petter Supply Co., Paducah, Ky., has been appointed an authorized tool distributor by the Metallurgical Products Department of General Electric Co. The organization will carry the company's standard Carboloy carbide metal cutting tools, as well as carbide-tipped masonry drills and diamond grinding wheel dressers. Another recently appointed cutting tool distributor is Southern Tool Distributing Co. of Atlanta, Ga.


A symbolic conception. For security reasons, the appearance of this aircraft cannot be revealed.


A master drill and setting gauge, showing use of Epon resins to duplicate compound curves and contours.

In building the supersonic Arrow . . .

Avro Aircraft, Limited saves time and money with

EPON® RESIN

dies, tools, jigs, molds and fixtures

Avro Aircraft, Limited—developing Canada's supersonic Arrow—is achieving major savings with Epon resin tooling.

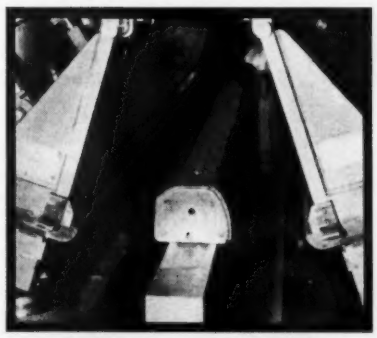
Epon resins provide faster, lower cost preparation of stretch dies, forming tools, drop hammer dies, jigs, duplicate master die molds, checking and assembly fixtures. Avro reports that in making dies of Epon rather than metal, manpower requirements are two-thirds less, which is reflected in correspondingly great savings in the unit cost of tooling.

The Epon resins have an ideal combination of properties for tooling applications. To list just a few:

- Exceptional dimensional stability, high impact strength, excellent resistance to abrasion, minimum residual stress in cured parts.
- Ease and speed of preparation.
- Low shrinkage in filled formulations, assuring perfect master reproduction; minimum warping and stresses.
- Adaptability to repairs and design changes.
- Minimum finishing requirements for smooth surfaces.

Like Avro, other leading manufacturers report savings as high as 80% with Epon resin tools and dies—for *production* as well as experimental and short-run work. Can you make comparable savings in your own operations? Find out by writing for technical literature on Epon resins for tool and die applications.

Epon-faced die requires only hand rubbing to achieve smooth finish. Radii are being touched up with sander.


Stretch die, with Epon resin facing of involved contours, ready for run on 800-ton press.

SHELL CHEMICAL CORPORATION

CHEMICAL SALES DIVISION, 380 Madison Avenue, New York 17, New York

Atlanta • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Newark • New York • San Francisco • St. Louis
IN CANADA: Chemical Division, Shell Oil Company of Canada, Limited • Montreal • Toronto • Vancouver

SHELL

CIRCLE INFORM-A-GRAM KEY NO. 65

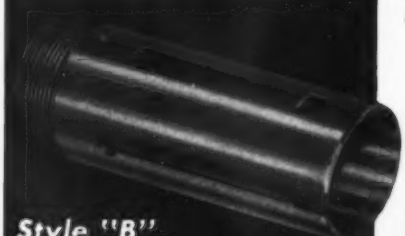
HARDINGE
ELMIRA, N.Y.

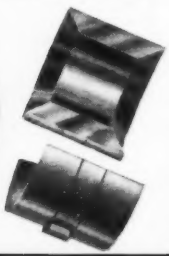
STANDARD EQUIPMENT
in
Progressive Screw Machine Plants

The Only MASTER COLLET
With No Work Pressure on the Screw.

Style "S"
Master Collets and Pads

Pads Interchangeable
Among Different
Makes of Automatics

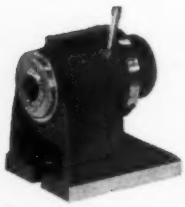




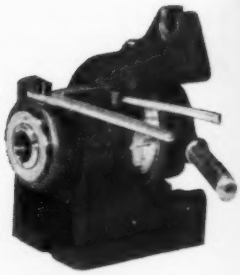
Style "B"
Master Feed Fingers and Pads

HARDINGE BROTHERS, INC., Elmira, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 661



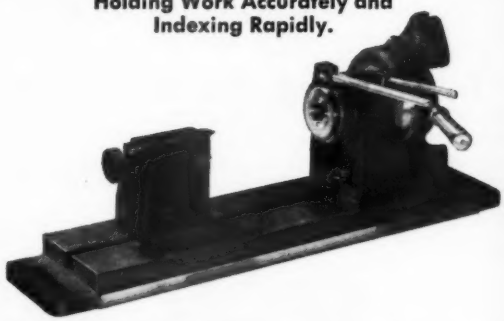
H-4 Tool Room-Inspection



HV-4 Production

HARDINGE
COLLET INDEX FIXTURES

Increase Production by
Holding Work Accurately and
Indexing Rapidly.



HARDINGE BROTHERS, INC., Elmira, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 663

HARDINGE-SJOGREN
Speed
COLLET CHUCKS

Fast — Accurate
Increase Production Capacity

Available in 1 1/16"; 1 3/8"; 2 1/4"; and 3 1/2" collet capacity. Threaded nose, cam lock, tapered key-drive and American Standard spindles. *Write for Bulletin 8A.*

HARDINGE BROTHERS, INC., Elmira, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 662

HARDINGE
ELMIRA, N.Y.

COLLETS
for
LATHES and MILLERS

ACCURACY — DURABILITY — LOW COST

Write for Bulletin 56 —
Complete collet ordering
information for all Lathes, Millers, Grinders and Fixtures

HARDINGE BROTHERS, INC., Elmira, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 664

Immediate stock delivery from Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Baltimore, Rochester, N. Y., Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, San Francisco.

At Your SERVICE

Die castings and permanent mold castings of zinc, aluminum, brass, and magnesium alloys are produced by Harvill Corp. of Los Angeles. With the company's method of die casting, metal is forced under pressures of 1,000 to 50,000 psi into accurately machined metal dies. The die casting and permanent mold production facilities cover a wide range of modern casting applications.

•

The gearing division of Westinghouse Electric Corp. of Pittsburgh has available design facilities and manufacturing capacity for producing quality, custom-made gearing. The division turns out gearing capable of greater load carrying capacity and with smoother, quieter rolling action to limit tooth wear. The division was one of the first to develop the use of heat-treated plain carbon steel for lower cost, dependable gearing.

•

Complete analysis and testing of titanium and its alloys is provided by Bowser-Morner Testing Laboratories, Inc., Dayton, Ohio. The firm offers a package service including complete physical and chemical data.

•

New facilities and techniques for the ultra-thin die stamping of special metals and alloys for critical electronic and instrument applications have been announced by Be Cu Mfg. Co., Inc. of Newark, N. J. The new stamping method assures high production of close tolerance parts, while maintaining all the characteristics of the particular material used. Among the special metals, which have been successfully stamped by the company, are Swedish iron, Alclad, tantalum, molybdenum, and super-thin sheets of plated ceramic.

•

A national service for repairing and rebuilding large conveyor belts has been announced by Conveyor Belt Service, Inc. of Virginia, Minn. Belts have been successfully rebuilt and returned to service after end-to-end rips, transverse cuts, impact breaks, cover tears, and edge injuries. The repairs are made with the same fabrics, friction materials, and gums and rubber compounds used in the original manufacture. This is done with specially designed drying oven, temperature controls, moisture detecting devices, belt tables, steam vulcanizing presses, experienced technicians, and close inspection.

F. Jos. Lamb Co. now uses Barnes Rocket Hack Saw Blades for low cost slotting operation.

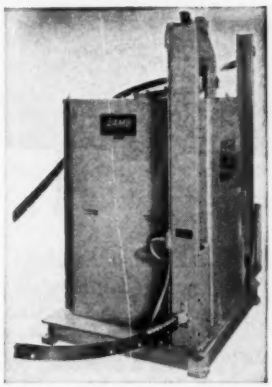
BARNES

POWER HACK SAW BLADES

SAVE $360.00 PER DAY

Slotting a set of 8 support arms was costing the F. Jos. Lamb Co. $60.00. The problem was presented to a Barnes' field engineer. He gathered the facts, including one that Lamb was seriously considering the purchase of new equipment for the job costing approximately $2,000.00.

The Barnes engineering department, after thorough study, recommended that the slotting be done by hack sawing. Barnes Rocket Blades, RT 1406-6, would give the correct slot width and insure straight, accurate cuts. A special fixture was designed adapting one of Lamb's hack saw machines (Cost: *less* than $200.00).



F. Jos. Lamb's new Stor-Matic Hitch-Lift is placing automation within the reach of all manufacturers. The Stor-Matic automatically stores and feeds semi-processed parts between standard machine tool operations.

The result—production of 4 sets for the previous cost of 1 set. Based on two shifts, this is a savings of $360.00 per day. In addition, F. Jos. Lamb Co. is obtaining more cuts per blade from Barnes Rocket Hack Saw Blades and immediate delivery from the stock of their local Barnes distributor.

The services of an experienced Barnes metal cutting engineer are available to you through your Barnes distributor. His recommendations on your hand, power or band saw requirements will increase your production and lower costs. Call your Barnes distributor today.

when cutting counts BARNES *count on Barnes*

W. O. BARNES CO., INC.

1297 TERMINAL AVENUE DETROIT 14, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 67

NEW ERICKSON EXPANDING-COLLETS

The new Erickson Expanding-Collet is the only known commercial expanding arbor that can grip in a hole as small as ⅛ inch. That's because it's a one-piece arbor actuated in the same manner as a reversed collet . . . a collet which grips the workpiece on the *inside surface*. Because of its one-piece design without drawpin, it gives maximum wall thickness and full gripping power equal to that of a collet.

That means you can convert your machine to internal chucking by merely inserting the new Erickson Expanding-Collet. And since it is machined in place on the machine, it gives greatest possible accuracy . . . can be re-machined for new jobs . . . solves the rush-order problem.

Order a stock of new Erickson Expanding-Collets. They'll save your time, your temper and your money. AA-3381

Write for your free copy of *"Erickson Expanding-Collet"* today. And also request "Catalog K"; you'll find cost-slashing applications for all Erickson holding tools.

APPLICATIONS

LATHES • TURRET LATHES • SCREW MACHINES
SPEED LATHES • AUTOMATIC CHUCKING MACHINES
BURRING MACHINES • MILLING MACHINES • DRILL PRESSES
CUTTER AND CYLINDRICAL GRINDERS • GEAR CUTTERS
INDEXING HEADS • COLLET CHUCKS • ETC.

ERICKSON TOOL COMPANY

2301-7 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 68

editorial:

It's Time To Re-evaluate

CEMENTED OXIDES — ceramics — for cutting tool applications are demanding more and more attention from Industry. This is rightfully so. These new materials promise so much in eventual benefits that a thorough investigation and continued testing of them by manufacturing research groups is justified to coincide with and stimulate further development of such materials.

We haven't been beating the drums for ceramics; up to now, they have presented too many pitfalls for the average shop. However, ceramic tooling now can look back at some mighty impressive research on many fronts. Much has been learned about the use and misuse of these materials; newer, better grades have been introduced.

Many have tried ceramic tools in production; few with success. But failures experienced two years ago, or one year ago, should not dictate refusal to again put ceramic tools to test. This is the time for everyone to become conversant with ceramic tooling and for the more advanced engineers with superior equipment to gain some first-hand experience. The time is close for *all* to develop such experience.

Much attention has been directed toward trying to make ceramics work where other tool materials have failed. This has seriously limited the extent of our working knowledge of the ceramics. Probably the most effective applications are on the machining of non-ferrous materials, non-metallics (where they have been successfully used for years), and cast iron.

Imaginative Engineers are suggesting use of ceramics on skiving tools, on reamers, on precision boring tools . . . where there are heat and wear factors, but where cutting forces are relatively light. Try to build up a record of success, not failure. As more is learned, more difficult applications can be approached.

Improvements will come in machine tools — greater rigidity, more universal availability of constant speed systems, better bearings for high speeds, and so on. Experimentally, ceramics have been used successfully in face milling cast iron at 15,000 sfpm; but success in production will come at considerably lower speeds.

During this high-fever rush to make ceramics work, don't short-change the cemented carbides! Carbides will be with us for many years to come, just as high speed steel is still with us. Progress in the development and production of carbides is not at a standstill. The last two years have seen many new grades introduced — each with its advantages.

Some experts say optimum performance of ceramics may be expected at twice conventional carbide speeds (at those higher speeds, high speed steel may again become competitive). But what about that broad twilight zone between conventional carbide speeds and ceramic speeds? Powder metallurgy that produced the carbides has already given us the first of a new family of cutting tool materials that are neither tungsten carbide nor ceramic . . . that may even preclude immediate extensive use of ceramics. Another material in this general category is currently giving fabulous results in an extensive field testing program.

Other research continues . . . research that will change many of the basic precepts of the machining art. Machining is rapidly becoming a science. Nuclear physics and high speed chemistry are shedding new light on old subjects. High feeds and high relief angles are here to stay.

Next month, a feature article in T&P will report early success with bi-carbides — the use of two carbide grades in one tool, with increase in tool life of 200 to 300%. High velocity grinding and electrolytic grinding, too, so extend tool life as to make carbides constantly more competitive with what ceramics may do.

New super-hard high speed steels are successfully machining high temperature alloys on some operations where carbides had met dismal failure. Diamond tools are returning to compete with carbides on fine boring and turning.

There is no status quo in machining. No engineer, no shop executive who wants to be competitive tomorrow can afford to sit on the empirical data of yesteryears that is the basis for virtually all current machining practice. It's time to re-evaluate your thinking relative to cutting tool materials and their profitable use.

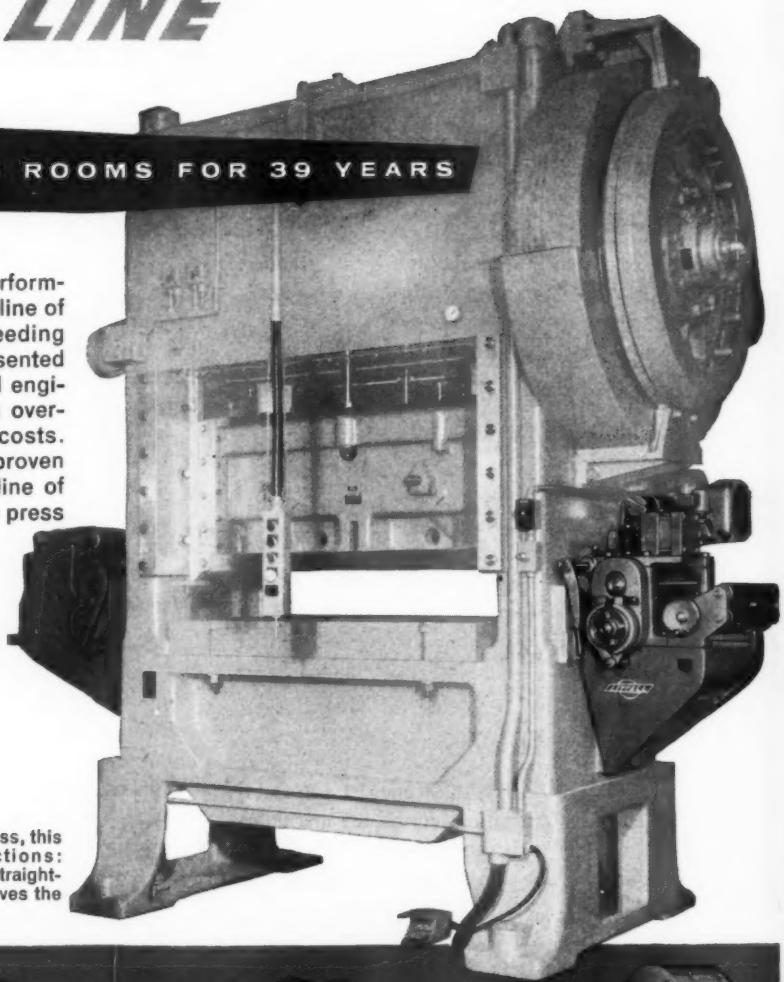
E. Willard Pennington

managing editor

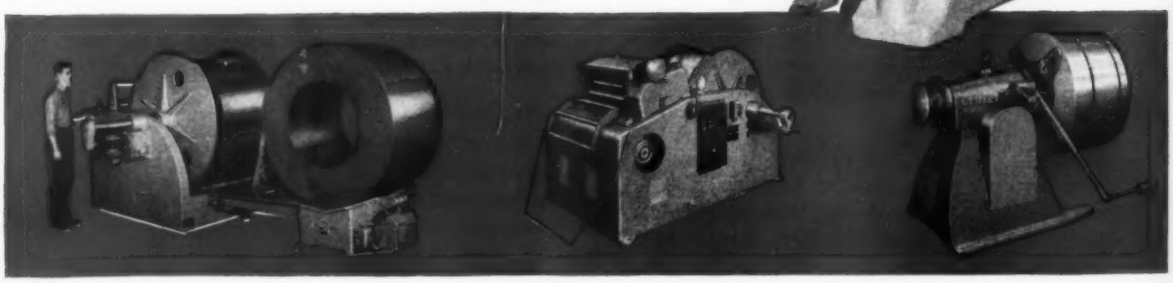
THE LITTELL LINE

PROVED IN PRESS ROOMS FOR 39 YEARS

39 years of proved, dependable performance are behind the complete Littell line of coil handling, straightening and feeding equipment. Since coil stock first presented a curvature removal problem, Littell engineers have helped press operators overcome it, to speed output and cut costs. This big edge in experience and proven quality makes the complete Littell line of today the preferred line among both press builders and press users.



LITTELL DOUBLE RACK AND PINION ROLL FEED, No. 5-24½
Mounted, as shown, on a modern punch press, this typical Littell Feed performs five functions: straightens stock (when equipped with straightener); feeds to the die; oils the stock; removes the scrap; cuts up scrap.



COIL CRADLE
Variable Speed Drive plus electric brake and clutch supply precise length of stock required at exactly the desired speed. Feed Range, 25″ to 100″ per minute. Holds two 10,000 lb. coils, one in reserve. Max. coil width, 36″, O.D., 58″.

STRAIGHTENER-COIL CRADLE
5-roll straightener flanked by powered pinch rolls. 18″, 24″, 30″, 36″ and 42″ roll widths. Variable Speed Transmission feeds 12′ to 72′ per minute. Reversible. Cradle takes 8,000 lb. coil, 48″ max. O.D.

REEL for 5-ton Coils
This motor-driven automatic centering reel with standard arm control handles coils up to 10,000 lbs., 36″ wide and 48″ O.D.

F. J. LITTELL MACHINE CO.
Speed with Safety 4197 Ravenswood Ave. Chicago 13, Ill.

ROLL FEEDS•REELS•STRAIGHTENING AND FEEDING MACHINES•COIL CRADLES•SHEETING LINES
District Offices: Detroit, Cleveland

CATALOG 56
sent on request gives full details. Write for it.

CIRCLE INFORM-A-GRAM KEY NO. 70

TOOLING & PRODUCTION

Production Drilling and Reaming of

PRECISION HOLES

Holes Can Be Speedily Drilled from the Solid with Extreme Accuracy and Finish, and at Lowered Cost, Using Trepan-Like Drills and High Pressure Coolant Fed through the Tool.

by Herbert Gregg
Chief Engineer
STAR CUTTER COMPANY
Farmington, Michigan

CONSIDERABLE ECONOMY in metalworking production operations is achieved when precision holes are produced from the solid in a single operation. Cost economy is a result not only of the elimination of an added reaming operation, but also of the increased feeds, close concentricity tolerances and improved surface finishes possible when carbide drills of special designs are applied to both cast iron and hard materials like stainless steel.

The ability of special carbide trepanning-type drills to produce precision holes from the solid under production conditions is illustrated by a variety of parts drilled on a battery of six precision boring machines using Starbore carbide drills. This contract drilling department has been set up in connection with a continuing development program to create special carbide

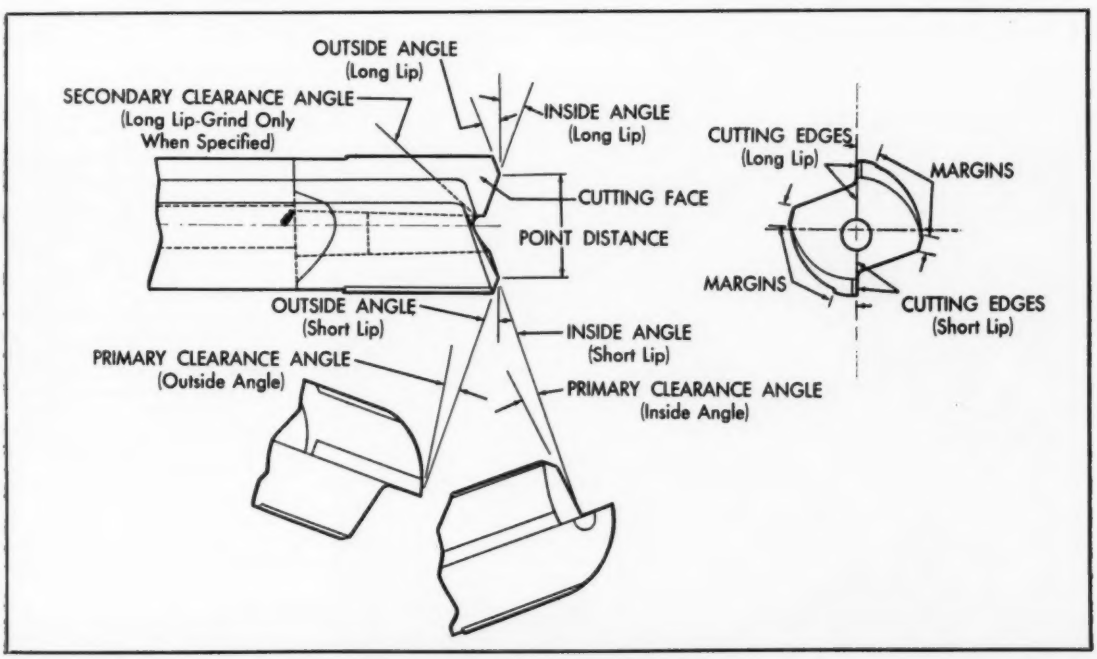


Fig. 1. Nomenclature for Starbore drills.

OPERATING DATA

Table I — 440 C Stainless Steel Parts — Starbore Drills

Part Name	Hole Size (in.)	Hole Tolerance (in.)	Hole Length (in.)	Surface Finish (mu, rms)	Concentricity with OD (in.)	Drill Speed (rpm)	Drill Feed (ipm)	Coolant Pressure (psi)
Valve Spool "A" (1⅞" OD)	0.619	±0.001	9	60	0.002	950	2	700
Valve Spool "B"	0.3720	±0.0005	3 3/16	10-25	0.0015	1800	2½	550
Link (2 holes)	0.280	+0.0005 —0.0000	¼	15-30	———	2150	2¼	350

Table II — Cast Iron Parts — Starbore Drills

Valve Body "A" (2 holes)	0.4375 0.750	+0.0005 —0.0000	5	40-50	———	3000	15	400
Chemical Pump Body	0.2501	+0.0002 —0.0000	2	20-30	———	3500	10	450
Pump Body	0.2500	+0.0003 —0.0000	3	12-25	———	3500	8	450

Table III — Reaming Parts with Starbore Reamers

Cast Iron Part								
Valve Body "B" (⅜" cored hole)	0.7495	+0.0005 —0.0000	8¼	30-50	———	1600	12	100
Nitralloy G Part								
Knuckle Pin (7/16" drilled hole)	0.468	±0.010	2½	40-60	0.003	1050	6	300

drills and reamers that will produce precision holes at high production rates while providing maximum tool life.

Some of the parts represent problems in long-hole drilling; while others illustrate parts made of hard-to-machine materials, where hole size, concentricity or surface finish specifications presented trouble with conventional twist-drill or gun-drilling tools.

The Starbore carbide drills (Fig. 1) utilized in these production operations are of special patented two-flute design. The tip of the tool, which has two cutting faces, is a molded carbide blank that is brazed to the tubular SAE 4130 steel shank. The through-hole in the tool is sufficiently off-center to cause a small pin to be generated during the drilling operation while leaving a passage for flow of pressurized coolant. The lip along the inside angle of the one cutting face is longer than on the other face. The radius of the pin generated is determined by the distance from the inner end of

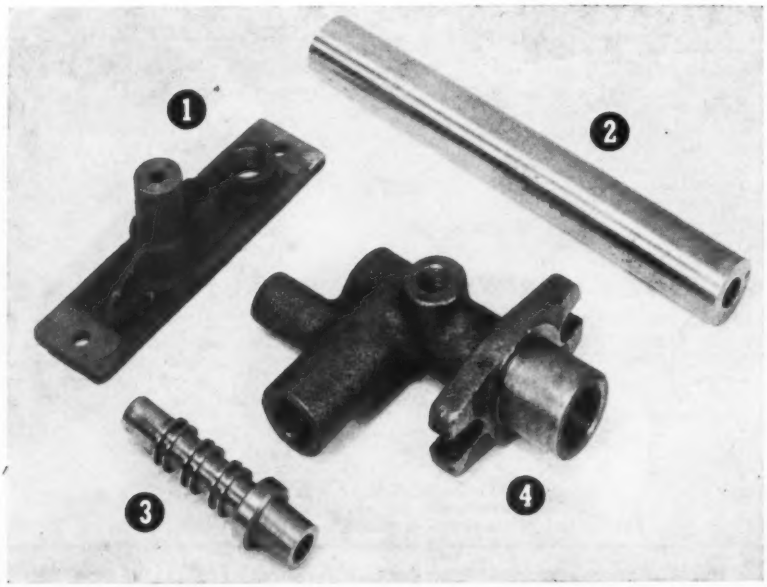


Fig. 2. A variety of stainless steel and cast iron parts in which precision through-holes are produced in production set-ups, using high pressure coolant fed through the tools. Key: 1, Chemical Pump Body; 2, Valve Spool "A"; 3, Valve Spool "B"; 4, Pump Body.

the **long** lip to the axial centerline of the tool. This trepanning-type action avoids the placement of carbide cutting edges in any zero surface feet location.

The pin that is generated during the drilling operation is flushed forward, at the end of the cut, into a bent tube that carries it into the machine tool chip area. Coolant is fed to the hollow spindle in the horizontal precision boring machine from a high-pressure unit at the rear of the machine. This unit includes a filter and magnetic separator. The drill, which can have a straight or a tapered shank, is held in the spindle by a conventional setscrew arrangement.

The carbide drill is guided initially by a hardened steel bushing. The drill is relieved along the shank so that the bushing does not guide the drill after it has entered the part a short distance. Coolant pressures, drill feeds and drill speeds vary with surface finish and accuracy requirements, materials, and hole size.

Tables I and II give results achieved in production runs on stainless steel and cast iron parts. Figure 2 illustrates several of the parts.

A typical index fixture setup for drilling two precision holes in a 30-35 Rockwell C stainless steel link is shown in Figure 3. While one part is being drilled in the lower position, the one in the upper position is turned end-for-end. A 0.0005″ hole tolerance and a 15-30 mu, rms surface finish are maintained in each hole. The coolant used for this operation is Sultran B-4.

A setup for drilling two different sized precision holes from the solid in a cast iron valve body is shown in Figure 4. The valve body is located on two dowel pins and clamped in position by a standard over-center clamp. One size of hole is drilled in a quantity of parts. Then the fixture plate is moved vertically on the base to another doweled position for drilling the other size of hole parallel to the first hole. This

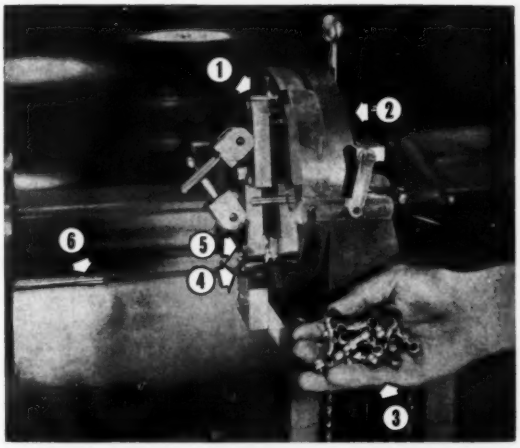


Fig. 3. A simple index fixture arrangement permits drilling precision holes in both ends of stainless steel links. Key: 1, Link in Upper Position; 2, Index Fixture; 3, Links; 4, Guide Bushing; 5, Link in Drilling Position; 6, Starbore Drill.

5″ long hole is drilled to a 0.0005″ tolerance at a feed rate of 15 ipm. Note the funnel-shaped hole at the right into which the pins are directed. As the drill breaks through, at the end of the cut, coolant pressure shoots the pin across the intervening space into the funnel. Coolant for this operation is Vantrol 5468-G.

Precision production reaming operations for long holes and parts made of hard materials are being performed with special carbide reamers utilizing several of the principles of the Starbore carbide drills. These reaming operations are also performed in the precision boring machines. Starbore reamers (Fig. 5) have a hollow tubular steel shank that carries the pressurized coolant. The tip of the two-flute reamer is a molded steel blank having two angular holes that direct the coolant to the cutting edges. Like the Starbore drill, this tool is guided by a bushing but is relieved so that no bushing guiding is done after the reamer has

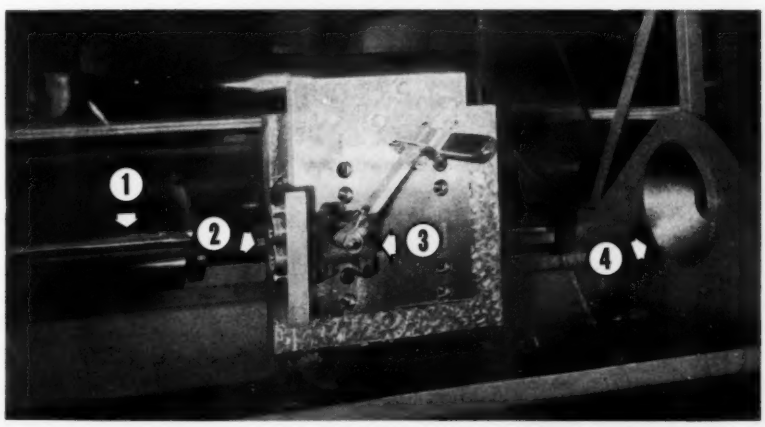


Fig. 4. A production setup provides for drilling two holes of different diameters from the solid in a cast iron valve body. One hole is drilled in a quantity of parts and the fixture is then shifted on its base, and the drill size changed, for drilling the second hole. Key: 1, Starbore Drill; 2, Guide Bushings; 3, Valve Body "A"; 4, Pin Funnel.

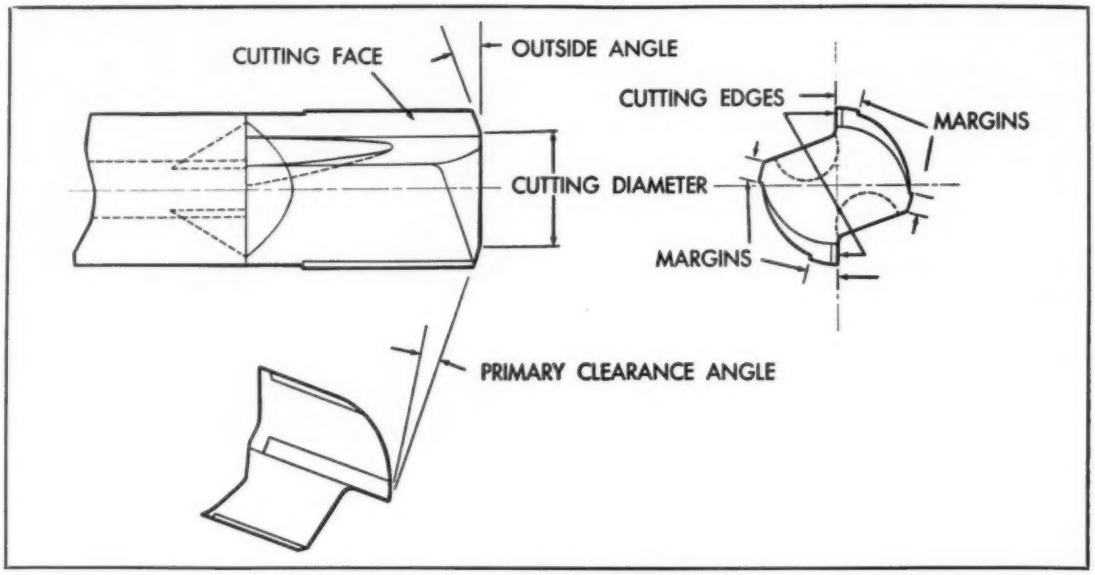


Fig. 5. Nomenclature for Starbore reamers.

entered the cored or drilled hole a short distance.

The coolant that is flushed out at the end of the part is carried by tubing into the bent tube and on back into the coolant tank. The same pressurized coolant system with filters and magnetic separator used in drilling is used also in the reaming operations.

A typical setup for reaming an 8¼" long cast iron cored hole valve body to precision tolerances is shown in Figure 6. The part is clamped with a standard over-center clamp on dowel pins in an angle fixture plate. The hole is held to a 0.0005" tolerance and a 30-50 mu, rms surface finish with a Starbore reamer feed of 12 ipm.

The application of an automation setup to a precision production reaming operation is shown in Figure 7. This magazine-loaded, fully automatic arrangement reams a 0.468" hole in a 30-35 Rockwell C Nitralloy G knuckle pin that has a previously drilled 7/16" dia, 2½" long through-hole. The hole is held to a 40-60 mu, rms surface finish and a 0.003" concentricity tolerance with a Starbore reamer feed of 6 ipm. The coolant used is Sultran B-2. Note the hose at the right of the fixture which carries coolant and chips to the bent tube on the end of the machine. The fixture is air-operated by the cylinder at the front. Table III gives detailed operating data for both reaming operations described here.

end

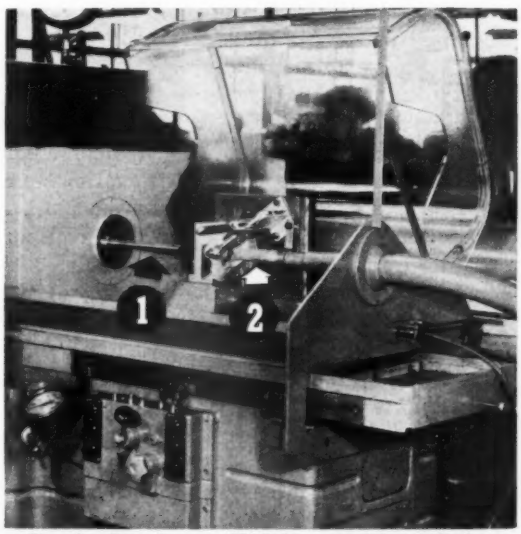


Fig. 6. Reaming an 8½" long precision hole in a cast iron valve body, using pressurized coolant. Key: 1, Starbore Reamer; 2, Valve Body "B".

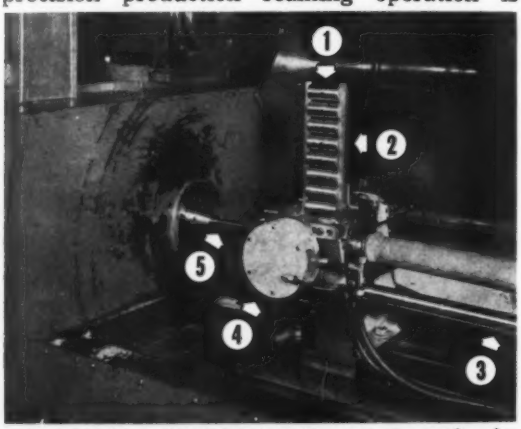


Fig. 7. Magazine-fed automatic setup is employed in production reaming a precision hole in Nitralloy G knuckle pins. Key: 1, Knuckle Pins; 2, Magazine; 3, Finish-Reamed Parts; 4, Air Cylinder Fixture Control; 5, Starbore Reamer.

HOLD THAT WORKPIECE

. . . or How to Apply 5 Basic Rules in Chucking Work for Turning & Boring

by E. C. Helmke
Assistant Chief Engineer
GISHOLT MACHINE COMPANY
Madison, Wisconsin

IT IS AN OBVIOUS FACT THAT, in any machining operation, the first problem is to hold the workpiece. Not only must it be held securely, it must also be properly located and properly supported. Certain basic rules and principles apply whether it is necessary to chuck or hold *one* piece or *one million* pieces.

Holding the workpiece for turning and boring operations frequently is given comparatively little thought because these operations are the oldest machining operations known, and excellent standard three- and four-jaw chucks are available on all machines. However, the lack of sufficient attention to certain basic principles can lead to expensive difficulties as discovered by one manufacturer not too long ago.

This manufacturer had an order for a thousand special electric motors, and decided to tool up the end bells on a small ram type turret lathe. Using a three-jaw chuck with standard jaws, he gripped the 2″ dia bearing boss (tapered and only about ¾″ long); he was greatly surprised that he could not get a suitable surface finish in machining the 9″ dia rabbet fit, even when every sixth or seventh end bell was torn out of the chuck. A set of comparatively simple soft chuck jaws specially machined to fit on a larger diameter, and costing less than $50 eliminated the problem.

Actually, there are only about five essential rules that must be followed in order to hold a workpiece satisfactorily. These are:

1. Grip the workpiece securely.
2. Locate the workpiece on critical surfaces.
3. Provide adequate support for frail sections or sections under heavy cutting pressure.
4. Reduce loading and unloading time to a value consistent with the quantity of parts to be produced.
5. If machining is done at high spindle speeds, solve the special problems these speeds may cause.

Spelled out like this, it is, of course, obvious to all of us that attention to the above five requirements is necessary in order to provide a satisfactory work holding device. However, it is extremely easy to forget one or more of these five requirements, and get into serious difficulties.

The problem of gripping the work securely makes it mandatory that the gripping be done on the largest possible diameter, so that wherever possible the gripping diameter is larger than the diameter which is being machined. This provides an automatic mechanical advantage for the gripping member over the cutting tools. Very frequently too, it reduces the overhang of the workpiece as illustrated in the example of the electric motor manufacturer mentioned above.

Grip on a Solid Section

The workpiece also must be gripped on a solid section wherever possible, and this section must be one that remains substantial after machining. A prize example of this problem is the multiple groove vee-belt sheave shown with its holding fixture in Figure 1. This sheave was located on a stub mandrel and was pulled back against a suitable driver by means of a draw rod, ring and "C" washer.

Pinching the rim "A" of the sheave between three drivers "B" and the ring "D" obviously should provide a very secure grip of the workpiece during the OD turning and grooving operation. Unfortunately, however, the sheave would slip during the grooving operation with

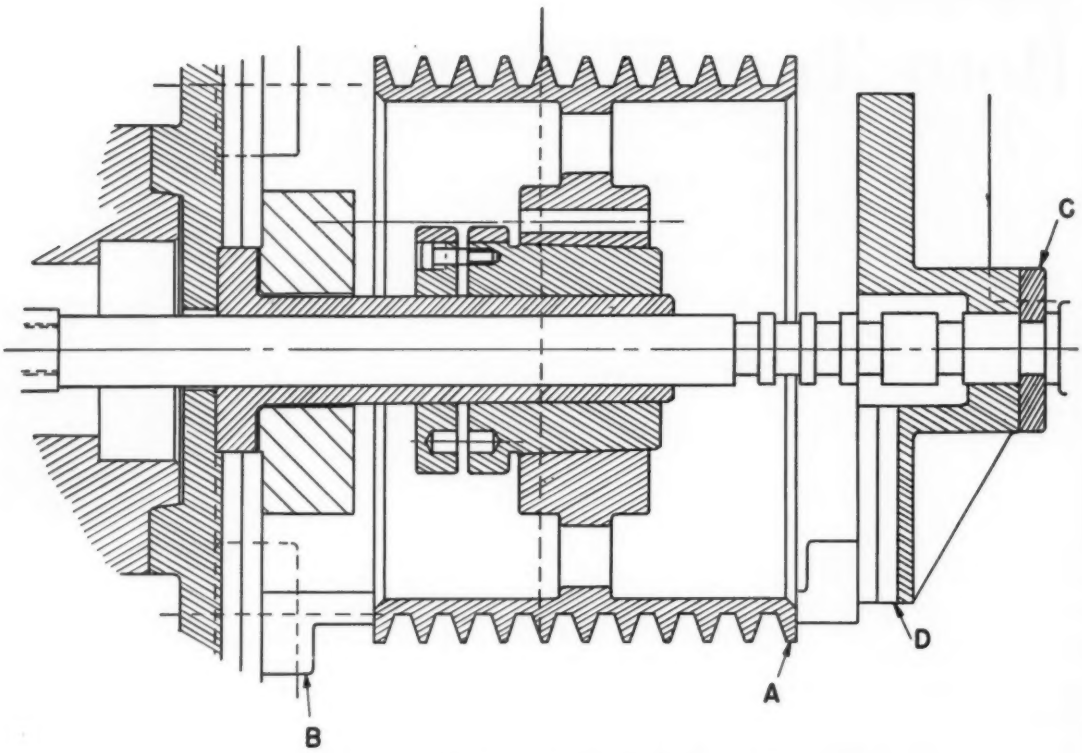


Fig. 1. This illustrates the problem of holding on a solid section. A solid driving pin located in one of the cored holes through the sheave web was found necessary, after the grooving operation caused the sheave rim to flex and allow the sheave to slip between drivers "B" and ring "D."

resultant damage to the finished sides, and frequent damage to the grooving tools. Two larger sizes of air cylinders were tried on the draw rod with no better results.

Close observance finally disclosed that the sheave did not slip until at least three of the grooves had been cut. The answer, of course, then was quite obvious: The rim of the sheave, which before grooving had formed a beautifully solid gripping surface, became resilient after three grooves were cut, and greater forces on the draw rod only served to distort the previously cut grooves to a greater extent. Providing a solid driving pin located in one of the cored holes through the web of the sheave quickly solved the problem.

Satisfactory machining of the workpiece also requires that the workpiece be suitably located. Sometimes location must be taken from a rough bore, and a spring loaded tapered plug similar to that shown at "C" in Figure 2 is required. The fact that the end of the plug is tapered, and that the plug itself is free to move axially in the fixture body, compensates for variations in the rough hole. Special chuck jaws that are either machined or ground in place, depending upon whether they are soft or hard, do an excellent job of locating on a previously machined outside diameter.

Match Pinion, Jaws & Scroll

One word of caution, however, with regard to the use of specially machined chuck jaws of this nature: When they are used on a three-jaw scroll chuck, the pinion that is used for tightening the jaws down on the spider used to hold the jaws in position for machining must be marked, and this same pinion must be used for chucking the workpiece in production. If this is not done, the necessary working clearance between the bore of the scroll and the chuck body will cause excessive runout on close tolerance work. Obviously, too, the special jaws must be marked so that if they are removed from the jaw bases and later replaced, they can be replaced on the same jaw bases on which they were originally mounted when they were machined.

Locating the workpiece axially in the chuck requires suitable chuck jacks which can be either adjustable or of a fixed height. In many instances, of course, this locating surface can be a step on the chuck jaws. Usually, however, it is better to avoid the use of surfaces on the chuck jaws for locating the work axially because these surfaces must of necessity move

with the opening and closing of the jaws. If location is to be taken from a rough surface, this jaw motion frequently causes undesirable axial motion of the workpiece while it is being chucked.

Locating surfaces should, of course, be kept as small as possible so they require a minimum of cleaning, and the old three-legged milk stool principle should be remembered so that location is taken from three surfaces and from three surfaces only. On special fixtures it frequently is desirable to provide a locating ring for locating the workpiece axially. Properly relieving the ring so as to reduce the contact area to three points results in solid location and reduction in the amount of cleaning required.

Frail workpieces, or sections under heavy cutting pressure, require support and occasionally this support can be provided by the locating jacks mentioned above. If location is taken from a previously machined surface, and the support is actually required at this point, more than three locating jacks can be provided. Very frequently, however, the surface that must be supported has no accurate relationship to the locating surface, and spring actuated and mechanically locked supporting jacks similar to the one shown at "A" in Figure 2 are required.

Here a comparatively light spring pressure behind each jack keeps it in contact with the workpiece while the workpiece is being gripped, after which each spring plunger or jack is locked in position with the thumb screw "B". The number of spring operated jacks or supporting plungers to be used, of course, will depend upon the amount of support that is required.

When designing this type of support jacks, the temptation always exists to operate them hydraulically by drilling passageways to a common reservoir, filling the passages with oil or grease, and providing a means of exerting pressure on this oil or grease. Unfortunately, this simple solution cannot be used because the localized pressure from the cutting tool over one jack will cause this to move away slightly, and inaccuracies, ripples and chatter may result.

Use Pull-Back Clamps on Frail Workpieces

Certain parts, as for example starter ring gears and certain jet aircraft rings, are so very frail that they can only be located radially with the very lightest of pressure. These items must then be held with suitable pull-back clamps so that the boring or the turning can be done with the workpiece in an unstressed position. If the part can be held with three pull-back clamps, these can be power actuated with a cylinder and a swivel mounted spider "A" on the draw rod as shown in Figure 3. The use of a duplex air or hydraulic cylinder and two spiders would, of course, permit the use of six pull-back clamps. Usually, however, when more than three pull-back clamps are required, they are hand operated.

Frail workpieces also present vibration problems due to cutting stress. Certain brake drums are good examples of this condition, and here neoprene lined dampening rings, pressure pads, or spring actuated plungers are frequently re-

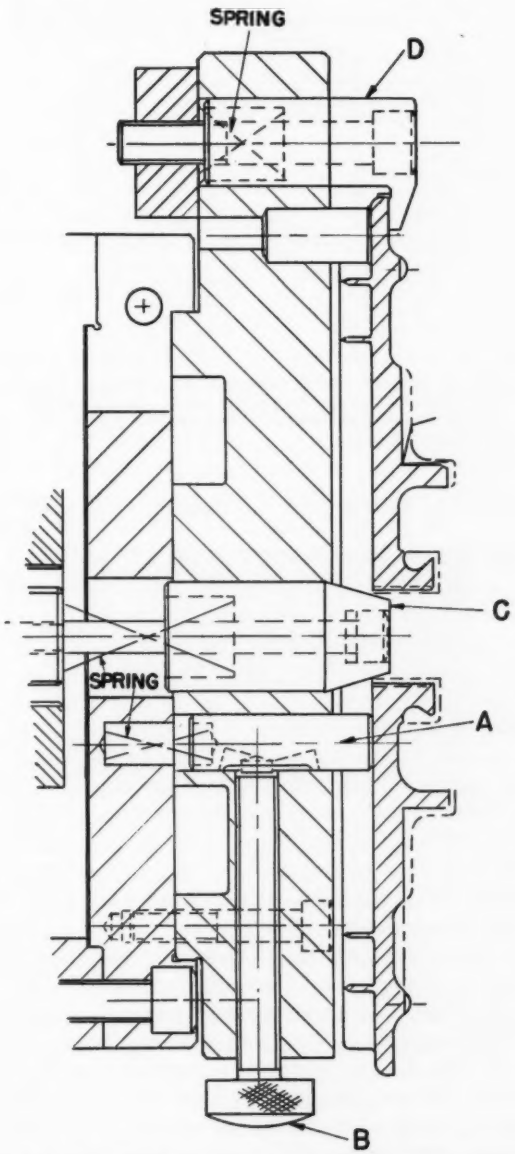


Fig. 2. Spring operated jacks "A" are needed to support frail workpieces. After the workpiece is gripped, each jack should be mechanically locked; in this case, hydraulic locking is unsatisfactory due to slight shifting caused by localized cutting pressures.

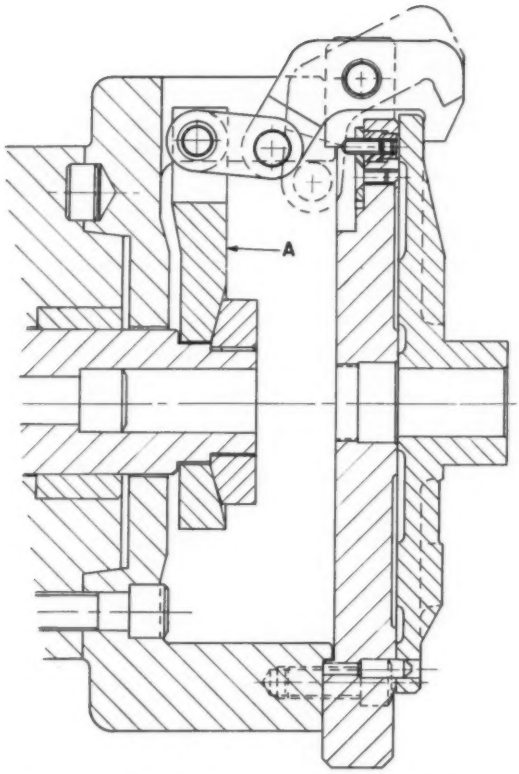


Fig. 3. Where radial pressures must be restricted, pull-back clamps are frequently used. These can be power actuated by means of cylinder and spider "A" on the draw rod.

quired to dampen out the induced vibration.

Use Power Chucking to Cut Idle Time

Since loading and unloading time is machine idle time, this time must be reduced as much as possible, particularly on high production jobs, and on jobs on which the machining operation is comparatively short. Excellent standard air or hydraulically operated power chucks are available and when applicable are comparatively cheap. If it is necessary to grip on four surfaces, standard four-jaw air chucks and duplex tandem air cylinders are available. For comparatively small cutting forces, magnetic holding devices and vacuum holding devices can be used.

Obviously, magnetic devices are restricted to ferrous materials and frequently result in chip difficulties. Vacuum operated devices, on the other hand, can be used on any materials provided the contour of the workpiece is such that a suitable area can be sealed off with neoprene sealing rings so that atmospheric pressure will exert sufficient holding force to resist the cutting strain.

Figure 4 illustrates a vacuum chucking device used by a manufacturer of household cooking utensils. The plug type chucking fixture is bolted to the machine spindle nose and is provided with a pipe connection "E" to the vacuum pump. A locating ring "D" equipped with a sealing "O" ring is provided, and the end of the plug fixture is provided with sealing ring "B" and vibration dampening ring "C" that bear on the inside bottom of the workpiece "A". Rings "B" and "C" are made of a 40-durometer neoprene and are cemented to the carrier plate. Ring "B" is a vulcanized endless ring that seals off the vacuum, while ring "C" is left with a small opening between the ends to permit the escape of air from the cavity between rings "B" and "C". A workpiece driver "F" is provided to permit the heavier cuts required on this job. Obviously, a similar pot chuck could be made for holding the workpiece while machining the inside.

In order to speed up the loading and unloading of the workpiece, springs should be provided under hand operated pull-back clamps as shown at "D" in Figure 2. Power operated pull-back clamps are equipped with a self opening linkage as shown in Figure 3.

Use Diamond Pin for Locating

Locating pins and studs must have tapered pilots and should have the locating surface as short as possible. If two locating pins are required, one of them must be diamond shaped with the narrow portion of the diamond placed so as to accommodate any variation in the location of the two locating holes in the workpiece. Whenever locating pins are used, power operated ejector pins must be provided to remove the workpiece from the locating pins.

Expanding arbors for locating and in many cases for driving from the bore of a workpiece can be of many designs. A few words of caution concerning their design may not be out of order. The stationary collet type is usually the most satisfactory and most efficient. Since there is no relative movement between the collet and the workpiece, they are much less subject to wear and have less tendency to damage the bore of the workpiece. Expanding arbors have been made with neoprene discs expanded by an air cylinder and a draw rod. These are very simple and cheap to make but, unless the cut is very light, are not very satisfactory.

Expanding pin arbors are used for chucking in the rough bores of shells and similar items. With the ends of the pins serrated and hardened, these work very well where required. Wherever possible, however, expanding arbors should be provided with a positive driver to help drive the workpiece. Obviously, too, locating shoulders or pins must be provided to

locate the workpiece longitudinally in the machine.

Higher Speeds Introduce New Problems

The new cutting materials and new machine tools with higher spindle speeds available present a few additional problems. Most obvious of these problems is the problem of air and hydraulic distributors on power operated chucking devices which may heat and wear rapidly. Fortunately, however, most manufacturers of these devices are keenly aware of this speed problem and have made provisions for it.

Vibration is another obvious problem brought about by higher speeds. This vibration can be due either to the machine itself, the chuck or fixture, the jaws, the bolts holding the chuck or fixture to the spindle, or the bolts holding the jaws to the jaw bases, and finally, due to the workpiece. Vibrations due to the machine and due to the chuck or fixture are practically always taken care of by the machine tool builder and the chuck manufacturer. However, the bolts that hold the chuck jaws to the jaw bases and the bolts that hold the chucks or fixtures to the machine spindles may vary somewhat in weight, and should all be brought to the same weight . . . particularly if it is necessary to remove the chuck or fixture at frequent intervals. Special jaws of course, should all be brought to the same weight. Irregularly shaped workpieces must be compensated for by suitable counterweights, and due to variations in castings and forgings sometimes can only be partially compensated for.

In any event, it is important that individual corrections be made for each of the above named sources of vibration so that — when a changeover is made from one set of chuck jaws to another, from one holding device to another, or from one workpiece to another — the source of any new vibration encountered will become immediately obvious.

Guard Against Loss of Chucking Pressure

Described above are the most apparent of the difficulties due to high spindle speeds. To these must be added workpiece distortion due to centrifugal forces, and the loss of chucking pressure on the ordinary lever operated power chuck due to centrifugal forces on the chuck jaws.

In a great many cases, this loss of chucking force is not serious since most air or hydraulic cylinders used have considerably more capacity than is actually required. However, when it becomes necessary to chuck a very frail part, this loss in chucking force with high spindle speed becomes of extreme importance since the necessary increase in chucking pressure to overcome centrifugal force may distort the workpiece while it is not revolving. In cases of this kind, a power chuck having a self-locking type of operating mechanism similar to that shown in Figure 5 is required.

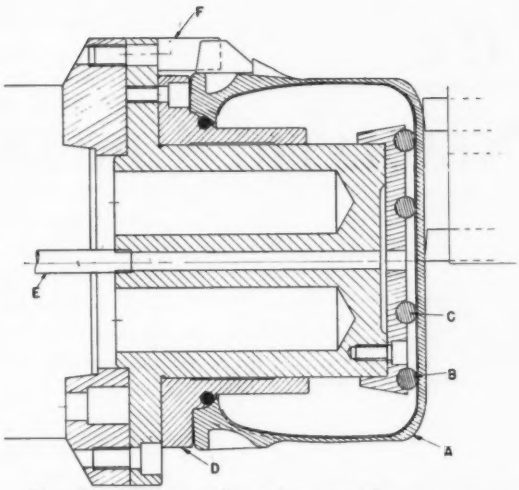


Fig. 4. Where work contour permits, a vacuum chucking device may be devised using neoprene sealing rings "B" and "C" rings cemented to the carrier plate.

This chuck differs from the standard air chuck in that the bell crank mechanism is replaced with angular tee slots in the sliding member "A" that is attached to the draw rod. The jaw bases "B" have an attached angular key that engages these tee slots, and any longitudinal motion of the sliding member "A" is translated into a vertical motion of the jaw bases. Since the angular tee slots in the sliding member "A" are machined at a locking angle, centrifugal forces cannot open the chuck jaws, even if an air line failure should occur.

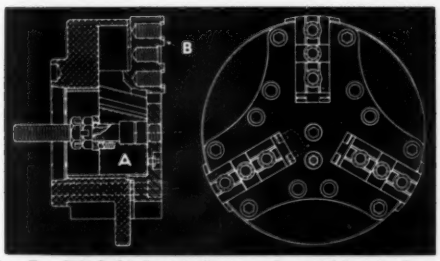


Fig. 5. With high spindle speeds resulting in loss of power chucking pressure due to centrifugal force, a self-locking type of mechanism is required.

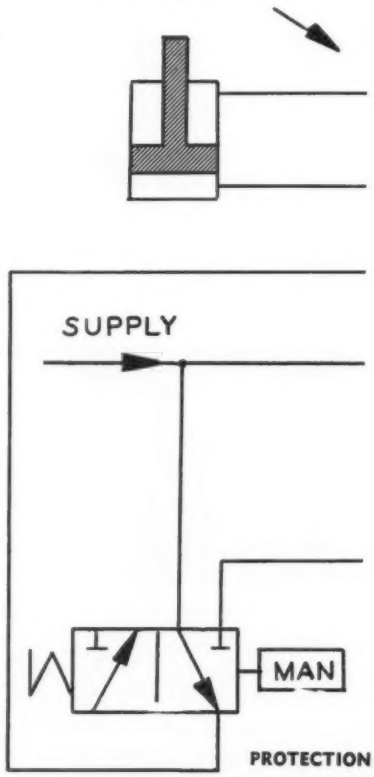
Adequate attention to the above mentioned five main principles will avoid most chucking problems. However, with these problems disposed of, such items as chip disposal, coolant distribution, poor tool life, chatter, variation in workpiece hardness, etc. will continue to plague those of us who enjoy making our living in the metal cutting industry. Perhaps it is fortunate that this is so, and that each day every job provides a new challenge. end

SAFE PNEUMATIC CIRCUITS

. . . More Examples of Our EASY QUICK Self Teaching Method

by William E. Hoffman
Associate Editor

MATCH THIS EDGE. PAGE 82



▲ READER SCRATCH HERE ▲

PROTECTION AGAINST LOW PRESSURE

PROPOSITION NO. 1. Where an air cylinder is to be used to feed a cutter into a workpiece, or move a piece in an integrated machine set-up, a minimum pressure must be maintained or integrated stations may become out of phase with each other.

It is necessary then to valve the air cylinders operating in these capacities so that they will retract, automatically, should the supply pressure drop below a minimum set pressure. Usually an interlocking switch will be tripped on the return stroke, which will shut off everything until line pressure has been restored. Further it is required that the outstroke and return stroke be controllable manually for set-up.

The space to the right of this partial diagram has been provided for you. Challenge yourself to complete the circuit with a four-way, 2-position valve whose spool is shifted by air pressure; a four-way, 2-position, spring return, cylinder operated valve; and a three-way, 2-position spring return, manually operated valve.

TO PROFIT MOST, as in a previous article of this nature, it is suggested that you 1) read through the text and appraise the **completed** diagrams; 2) then complete the incomplete diagrams, in the space allowed; and then 3) match the pages as indicated to check our solutions against yours.

Air devices are powerful; and, if used improperly, they can be a safety hazard. Air power control systems should be designed with consideration for the safety of the operator and the equipment they service; they should be "doped" out on the drawing board and then checked by an authority.

• A two-way valve is a shut-off valve.

• A three-way valve has three ports*1; an inlet port, a port to the device to be activated (this port also receives the exhaust from the same device, when the valve position is changed), and a port for exhausting (usually to the atmosphere).

• The four-way valve (the most versatile) can be purchased in either 2-position or 3-position. The 2-position can be piped to feed compressed air to one device while exhausting another, or in the 3-position version it can be purchased with all ports blocked in its middle position*2.

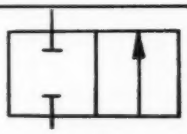
• Sequence valves pass air to the next device in the sequence by opening at a predetermined pressure. This is accomplished by a pressure build-up against a spring whose tension is adjustable.

---

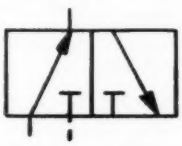
*1. Industry furnishes a tremendous variety of special valves which are built around the several basic schemes. For instance the three-way valve can be had with all ports blocked in the middle position, with more than three ports, etc.

2. In certain instances the four-way valve is very helpful when exhausting is arranged in the middle position.

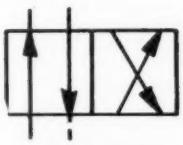
The JIC symbols you will find in the completed circuits and need to complete those circuits which are incomplete:



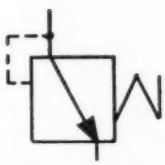
Shut-off Valve Two-way (2-port)



Three-Way Valve (3-port)

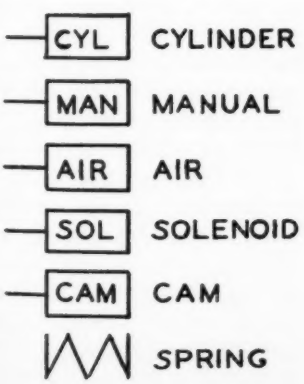


Four-Way Valve (4-port) (2-position)



Sequence Valve

To indicate the manner in which the valve is actuated: Attach the proper rectangle, by its tail, to the valve symbol.



Often the pneumatic circuitry operating in small shops appears to be something whomped up on the strength of the fact that a few components were on hand. The scene was set by the delivery date on a purchase order and away someone went, with a pipe wrench and the bare essentials. An arrangement was piped that would hold the part, advance and retract the cutter, kick out the finished work, and index the next piece. But, is it safe for the operator or the machine?

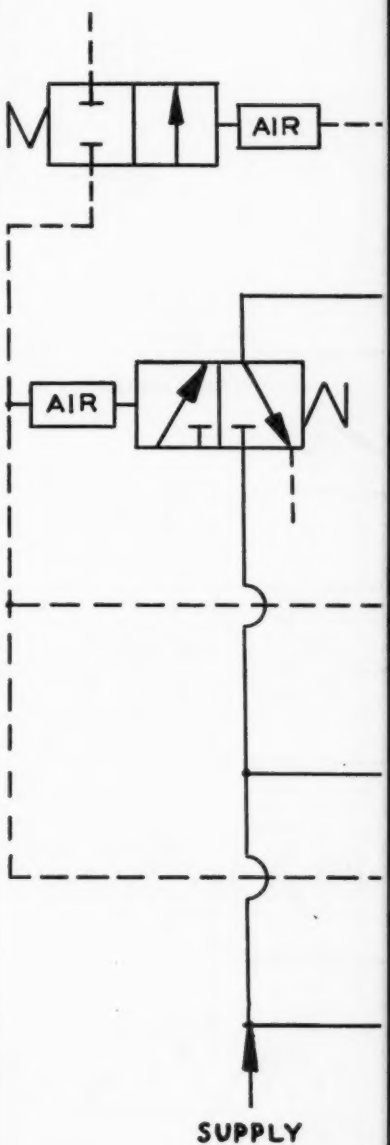
Even if the operator is not negligent, has he been provided with the safety he deserves as a human being? What if the compressor fails? How about low pressure in the morning when all pipes are tapped for air? Will the work in his air vise remain clamped or let fly and decapitate someone? Will cutter or machine parts replacement cost be unnecessarily high? Will production downtime be comparable to the almost negligible cost of valving and piping it right in the first place — for safety?

Manual emergency stop and return provisions should be provided in case automatic measures have not been. A machine is too many horses for bare hands; and, even though the operator may be attentive, he is helpless without the controls to act with.

Figure 1 shows an excellent arrangement for the protection of an operator's hands on a press equipped with a mechanical clutch. The circuitry is simple and inexpensive as the pilot valves are small and uncomplicated. However, if a machine is complex to the extent that the principle in Figure 1 cannot be used, other circuitry can be installed which will safeguard the operator, if he will cooperate.

For instance two three-way valves can be used in series to

MATCH THIS EDGE. PAGE 83



SOLUTION TO PROPOSITION NO. 2

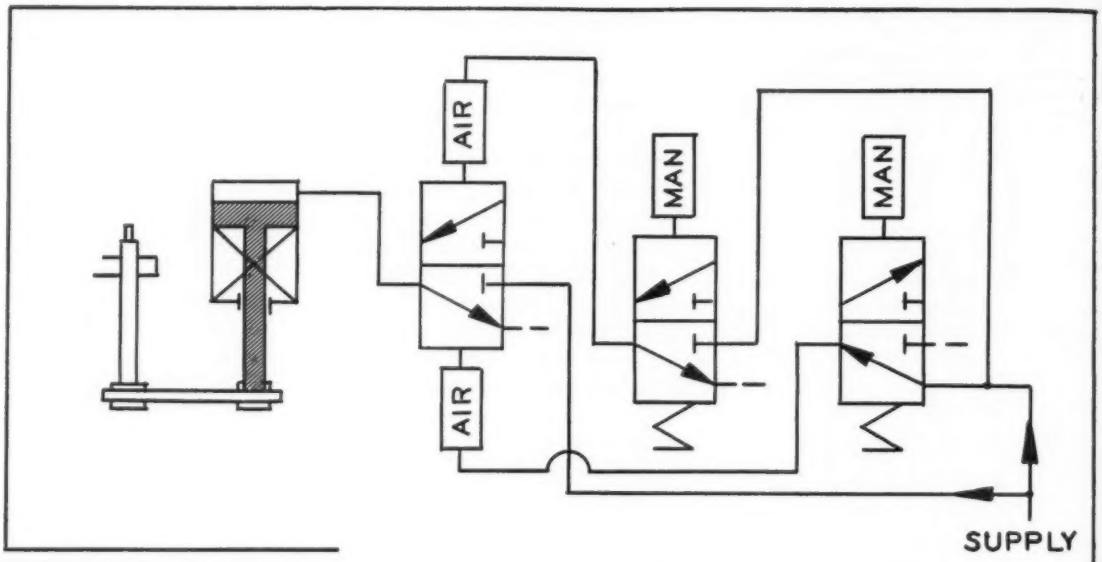
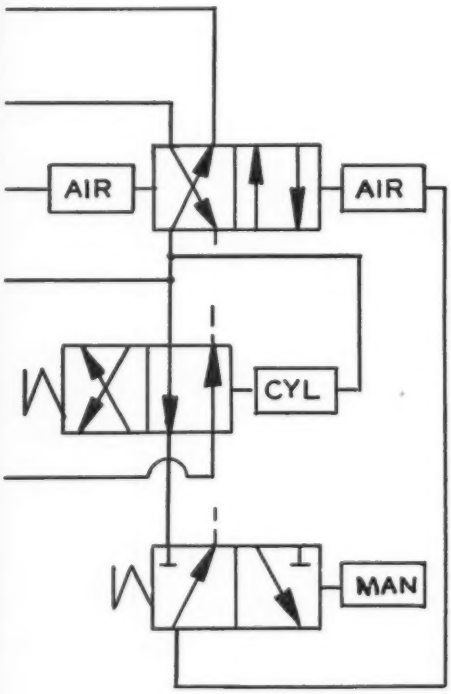


Fig. 1. SAFETY FOR HANDS. Completed diagram showing how to hook-up a safety circuit for power presses, brakes, shears, or other machines using mechanical clutches. With this installation it is necessary that the operator have both hands occupied by the control valves before machine action will take place. The principle is not new and there are many ways of effecting the same results. This is one method.

After the part is loaded the operator presses both pilot valves — one with each hand. This shifts the spool in the three-way, 2-position master valve, and air flows to the blind end of the single action cylinder, extending it to pull the clutch pin. Releasing pilot valves will cause the master valve to return to its other position for exhausting air from blind end of cylinder for its spring return.

MATCH THIS EDGE. PAGE 80



SOLUTION TO PROPOSITION NO. 1

pilot control a four-way master valve. Here the operator could tie down the valve nearest the master valve and operate with one valve. Peculiar to a shop's production facilities, where automatic feeding may occasionally be employed on two machines side by side, this tie-down feature might be permissible. But care should be exercised in its use. When the operator again goes back to one-machine responsibility, and manual loading is again employed, it would be best to weigh the length of time this condition will exist (and the hazard involved) against revalving the controls; or, just revalve and play safe.

Pneumatic control for a four-hand operation is almost a must, especially where two operators are working on a press out of sight of each other. Too, the noise level is often objectionably high and warnings or signals may be impossible. If this be the case and 4 three-way valves (for pilot operation) seem to be the answer, it is imperative that no valves be tied down. Usually operators will cooperate under these circumstances. It is when they *can* see each other, and believe themselves infallible, that accidents occur.

Electrical operation of safety controls will be covered in a later article. However, a few words in their behalf. Today, solenoids, limit switches, and other electrical devices are very dependable and will do a good job for you. Electrical wiring is usually less expensive than piping and electrical devices are most compact. Where *exceedingly* fast speeds are important for a pneumatic system, electrical controls are the only answer. However, the speed of pneumatic control is measured in fractions of a sec-

ond and should not be underrated. In most instances either can be used.

Ideal operating pressures can be maintained by the use of a sequence valve, as shown in Proposition 2. Should there be a jam or should trouble occur that would endanger the operator, the machine, or the workpiece, the pneumatic power device will retract automatically.

Circuit reversal provisions are often helpful on machines where the table reciprocates. The operator should be provided with controls to stop or reverse the action if something goes wrong during an operation. In Proposition 1 this provision has been made — as well as automatic reversal in case the operator is napping.

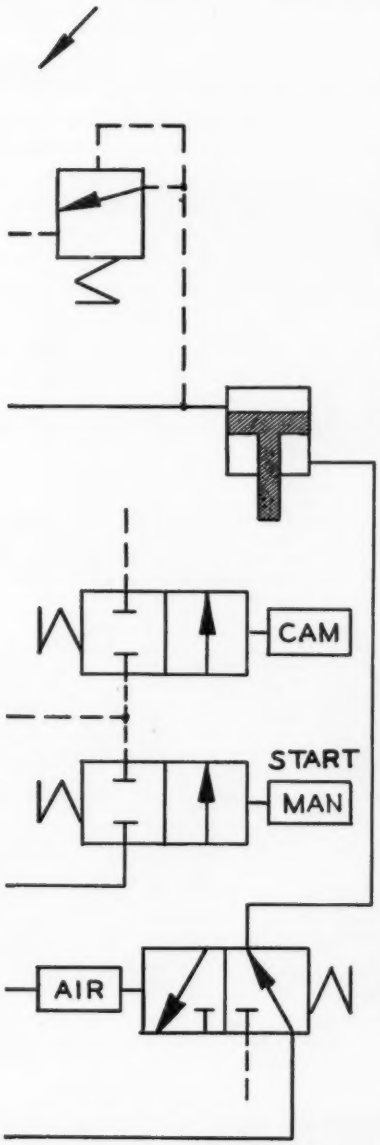
Even though emergency stop and emergency reverse are included in a system, provision should be made to stop the drift of table or work if these emergency measures take over. This can be incorporated more easily in the initial circuit system layout, by the strategic placement of check valves in the supply and exhaust lines. Drifting is caused by a transfer of air between components (and leakage), which will not occur if stopped by check valves.

Safety circuits are intended for the protection of operating personnel and expensive equipment and machinery. Whatever safety provisions are used, circuits should be arranged to fail safe. Interlocking, whether electrically with limit switches or pneumatically with cam operated valves, will accomplish this.

Your enthusiastic response to our first reader-participation article has prompted this one. MAY WE HEAR FROM YOU AGAIN. YOUR COMMENTS WERE APPRECIATED.

end

MATCH THIS EDGE. PAGE 81



▲ READER SCRATCH HERE ▲

PROTECTION AGAINST OVERLOAD

PROPOSITION NO. 2. An air cylinder is to be used to feed a cutter through the workpiece with a predetermined pressure. In order to meet a production schedule, this pressure is being maintained dangerously close to the workpiece or cutter break-point. Should something go wrong (flaw in material, etc.) and cause a bind, one or the other will constitute a hazard when broken. So it is necessary to relieve this pressure build-up instantly and reverse the action. It is required also that a manual start valve be supplied and a cam actuated valve for the return phase of the cycle.

In the space to the left please provide the two missing valves and complete the piping. The complete circuit consists of 3 two-way valves, one manual, one cam, and one air operated; and a sequence valve which has been set to open when the pressure rises above the safe operating pressure. All valves used here are spring controlled in one direction.

Th valves and the air cylinder are shown in a static position before start button has been depressed.

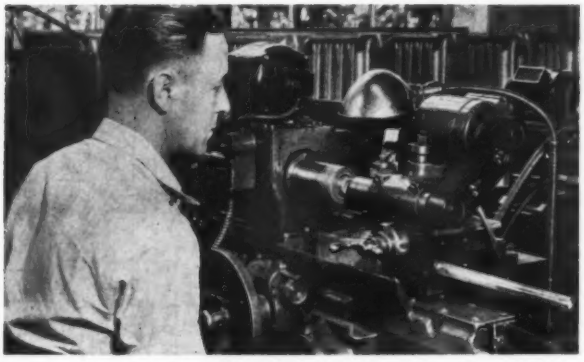
TOOL POST GRINDER'S VERSATILITY SOLVES MANY SHOP PROBLEMS

ALTHOUGH TOOL POST GRINDERS are usually mounted on other machine tools, their versatility is unlimited when it comes to using them as bench grinders for standard production operations, or for special setups.

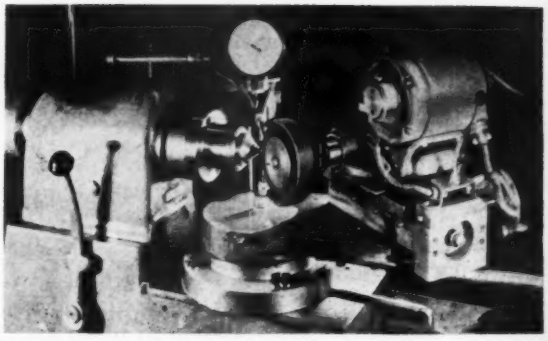
They are easily mounted on practically any bench, cause little or no vibration, can be removed for use of machine tools in emergencies, and are simple to service, according to The Dumore Company. A large assortment of quills permits internal grinding at various depths with tool post grinders. The accompanying illustrations point out specific uses for them.

end

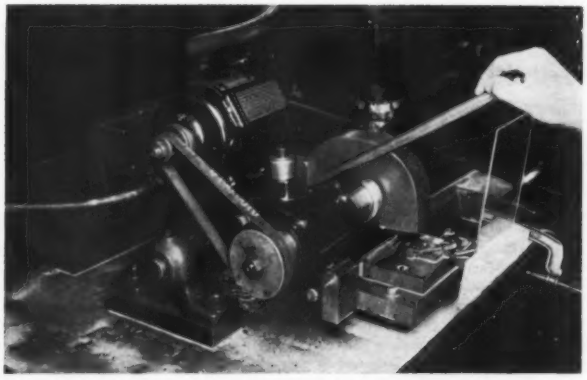
The delicate job of free-hand grinding the guide design on carbide rotary file blanks is handled on this ½-hp bench-mounted tool post grinder. The quality of parts depends on the grinder's skill and the vibration-free speed of the tool post grinder.



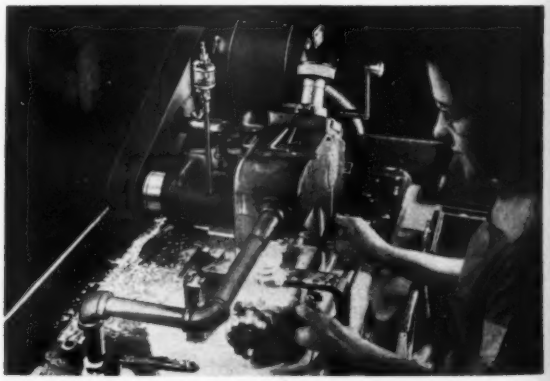
Accuracy up to 0.0001" is maintained on this tool post grinder mounted on a second-hand grinder base in a shop specializing in precision internal grinding jobs.



Mounted on a pivoting arm, a medium-power tool post grinder swings the abrasive wheel in an arc around the spherical end of "dog-bone" connecting rods. Rods 1⅛" long are held by an air collet in the live spindle. Finish is held to 0.0002".



Mounted on a counterbalanced flat plate which pivots on journal bearings, another medium-duty tool post grinder is used to cut off hard metal pins when the lever is depressed. A plunger ejects the pins in the special setup.



In this special setup for polishing drill flutes, the heavy-duty tool post grinder is equipped with foot pedal controls to leave hands free for high production. Coolant is piped in and a sight-feed oiler keeps the spindle lubricated.

COMPLETE GRINDER AUTOMATION MADE POSSIBLE BY NEW WHEEL DRESSING PROCESS

A PROCESS THAT ELIMINATES TIME-OUT for wheel dressing provides automatic size control and greatly increases the effectiveness of modern production grinders. The new process combines two striking developments: Perpetual form control of grinding wheels (PFC), and form cutters that use cemented diamond particles in a powder metal cutter body (CDP).

The process and needed equipment have been under development by Jones & Lamson Machine Company and Koebel Diamond Tool Company for the past 5 years. They make possible:

1. Complete automation of grinders.
2. Ability to re-shape and re-size wheels more rapidly than by any other known method. Re-shaping and re-sizing can be continuous — with no cycle-time for wheel dressing — or intermittent as desired.
3. Up to hundreds of thousands of pieces can be produced on a grinder without any attention to the cutter-dresser. The first production application has been in continuous operation with the same CDP cutters for over a year.
4. Freer and faster cutting of the grinding wheel is obtained. The wheel surface remains free of debris and has an open structure made up of sharp cutting edges.
5. Desired grinding wheel shapes and forms can be produced and maintained within narrow dimensional limits. Any surface finish down to 30 rms can be attained.

The PFC equipment required consists essentially of attachments to existing machine designs. The cutter which maintains the wheel shape and size acts much like a milling cutter with thousands of cutting teeth set in the body in such a manner as to continuously generate an accurate form. The cutter is motor driven in contact with the wheel at a speed somewhat higher (up to 500 sfpm greater) than that of the wheel. For optimum cutter life, proper coolant control is required. Coolant is supplied through properly shaped nozzles at relatively high pressures (25 psi approx.).

A differential feed arrangement advances the grinding wheel (and cutter) in the exact increments called for by removal of grinding wheel stock by the cutter, so that correct work size is automatically maintained during the life of the wheel.

The development of cemented diamond particles, for use in tools and cutters in the dressing of grinding wheels, is the logical continuation of pioneering efforts to take advantage of the remarkable hardness of the diamond in its most economical form. This trend has been to devise methods to use diamonds of smaller size for performing functions previously relegated to larger diamonds.

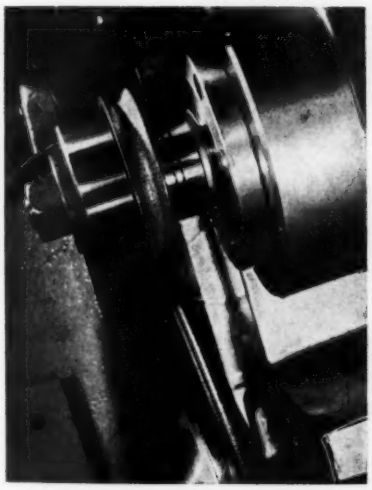


Fig. 1. Closeup of the CDP cutter dressing and shaping a grinding wheel. Thousands of fine diamond particles can be seen in the powder-metal cutter body.

In 1930 the first big step was taken by Koebel in patenting the powdered metal technique for mounting diamonds. As a culmination of this program, cemented diamond particles or CDP tools and cutters were developed to utilize the ultimate in smaller diamonds, namely diamond powder.

The CDP cutters embody several major advances as to both powder metallurgy and multiple diamond setting. The cutter bodies had to be and are being held to far closer tolerances than those common in powder metal fabrication. The diamond particles are set into this matrix in such a way that the form they generate in cutting is smooth and accurate.

Since CDP cutters when used with PFC dressing mechanisms provide continuous automatic control of accuracy of grinding wheels and wheel action, they promise to permit the use of grinding on operations not formerly considered suitable.

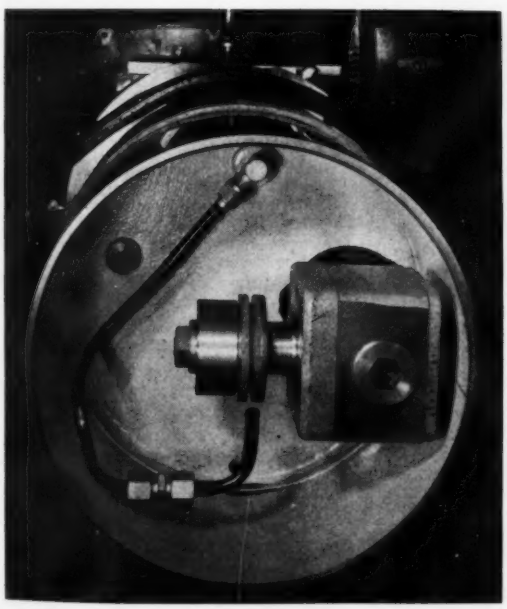


Fig. 2. Simple Koebel CDP cutter mounted in a J&L PFC feed cylinder (shown here removed from machine). The entire cylinder feeds forward, keeping cutter in contact with the wheel. Pressure jet cooling is used.

Fig. 3. Multiple Koebel CDP cutter set up on a Model E J&L grinder for multiple grooving of transmission shafts. The setup grinds four grooves ranging from 0.069" to 0.135" wide and from ⅛" to ¼" deep.

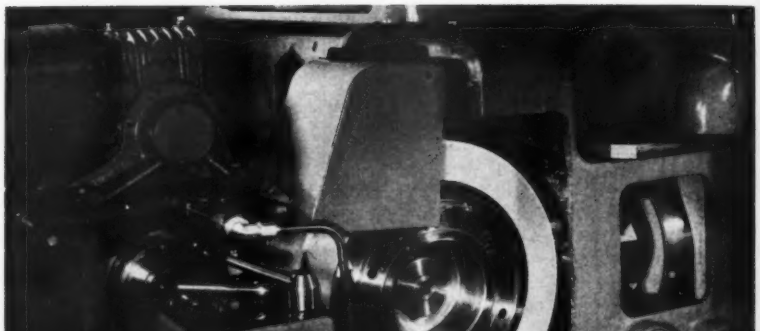


Fig. 4. Complete J&L Model E grinder, with PFC and CDP ready for addition of automation equipment. The cutter used here is the one shown in Figure 3.

Up to the advent of CDP cutters, no continuously reproducible control of grinding wheel action — an essential for complete automation — had been possible. None of the usual methods of wheel sizing and shaping lend themselves to complete automation of grinders.

The cutters can operate in either intermittent (as preselected) or continuous contact with the wheel while it is cutting, and yet cutter life ranges into the hundreds of thousands of parts. During this time there is no change in accuracy of the parts produced by successive grinding wheels.

The cutters can be used to shape grinding wheels right from the solid. Wheels can also have forms removed with CDP cutters before new forms are cut in them. A ⅜" deep form, 2" wide, can be removed in less than 5 min.

Fig. 5. Cutter fixture is shown at top with four cutters for shaping the four grinding wheels used to cut four grooves in the splined shaft shown at the bottom.

The PFC control equipment which drives the cutter is compensating in character. Infeed of the cutter into the wheel is incremental. Similarly, the rate and frequency of the infeed of the wheel is adjustable to just balance or exceed slightly the amount of attrition on the wheel due to the work accomplished.

First uses of the process are applications in which difficulty had been experienced in holding product accuracy. A typical example is the grinding of narrow grooves in hardened steel automotive and aircraft parts. This becomes quite simple when CDP cutters and PFC permanent form control are employed.

end

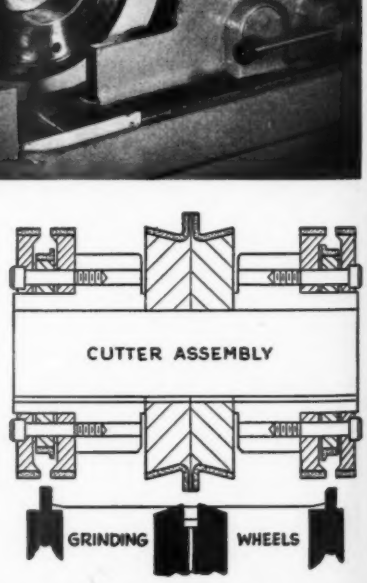


Fig. 6. Assembly of multiple cutters showing ways in which simple cutters can be combined to maintain form on complex wheels.

Press forming lubricants are frequently known only by trade designations. The mystery surrounding this subject has resulted in the trial and error procedure for adoption of a product more often than can be justified in the light of technical information available.

Choose with Care

YOUR PRESS DRAWING LUBRICANTS

by Leon Salz
Manager, Lubricants Division
MAGNUS CHEMICAL CO., INC.
Garwood, New Jersey

THE EFFICIENT METALWORKING PLANT is constantly alert to economies that may be provided by savings in labor, overhead, and the costs of raw materials and utilities.

The highly competitive market among stamping and deep drawing plants requires that overall production costs be carefully figured. A miscalculation with respect to the difficulties that can be experienced in a drawing operation may nullify the anticipated profit. Not uncommon is the shop that submits a bid on the basis of experimental trial runs, only to find that serious problems arose in mass production.

One of the most frequent causes of difficulty is inadequate lubrication. While design of the punch and die, metal quality, and severity of the draw are important factors in determining the degree of difficulty of the drawing job, the selection of a suitable drawing lubricant frequently overcomes problems arising from shortcomings of aforementioned nature. Excessive rejects attributable to poor ductility of steel when using soluble oil as a lubricant are sometimes corrected by changing to a compounded drawing oil. Similarly, a difficult stainless steel draw may be possible with only one type lubricant composition, all others resulting in failure. The need for careful press drawing lubricant selection is well recognized in the industry and its importance cannot be over-emphasized.

Intimate knowledge of the relationship between composition of drawing lubricants and expected performance is not generally known to press room personnel, nor is the subject abundantly covered in technical literature. Lubricant materials are frequently known to their users only by trade designations and the adoption of material for use is more on a "trial and error" basis than can be justified in the light of technical information available.

Functions of Drawing Lubricants

The purpose of a metal drawing lubricant is to provide a film between the work and the tools (punch and die), capable of permitting the desired shaping and/or elongation of the metal under pressure with a minimum of friction and wear.

When work-tool pressures are low, straight mineral oil, general purpose soluble oil, or dilute soap solutions can give satisfactory service because the force is not great enough to rupture the lubricating film. As pressures become greater, compounds containing sufficient "oiliness" (polar) materials such as fatty oils, waxes, and concentrated soaps are required. These physically adherent materials are adsorbed to metal sur-

Adapted from a paper delivered by Mr. Salz before the American Society of Lubrication Engineers at their annual meeting recently held in Detroit.

Inadequate lubrication is evidenced by scratch marks on the work, metal tearing, wrinkling, and buckling. This flanged drawpiece exhibits "metal tearing".

faces, maintaining a persistent monomolecular film where lubricants lacking sufficient oiliness would be squeezed out. When pressures are very high, as in severe draws, the corresponding rise in work-tool temperatures reduces the adherency of oiliness materials. Some form of "extreme pressure" material is then usually required if welding or seizure between the tool and work surfaces are to be avoided. (Welding or seizure is evidenced by metal "build-up" on the punch or die, causing scratch marks on the work drawn. Improper lubrication may also result in tearing of metal, wrinkling, buckling, and other "reject" conditions).

The available extreme pressure (EP) agents function by either chemical or mechanical methods. Those that provide EP characteristics to drawing lubricants by a chemical method usually contain loosely combined chlorine or sulfur which react with the punch, die, and work to form chemically protective films that are highly resistant to welding. Compounds that function mechanically minimize friction by incorporation of powdered spacing agents (pigments) such as chalk or graphite, these substances acting as mechanical separators between the tools and the work.

Drawing Lubricant Components

There are five principal classes of materials that may be present in press drawing compounds. These are oiliness agents, extreme pressure agents, emulsifiers, diluents, and inhibitors. From this category of substances, the manufacturer selects appropriate individual compounds or mixtures of compounds and blends them in proportions required to produce a product that will do the job intended.

Let us consider each of these five classes separately, indicating characteristics that are common to all substances in a class and the variations within the group.

Oiliness Agents — These substances are organic compounds having a minimum of 14 carbon atoms and possessing one or more polar groups. The latter groups are characterized by a fixed combination of atoms that have strong physical adherency for metal surfaces and orient themselves tenaciously thereon. Typical of polar groups are the carboxyl group (—COOH) present in fatty acids, the carbonyl group (C=O) present in fats, and the hydroxyl (—OH) present in alcohols. The long carbon chain does not have an affinity for metal and stands out upright from the surface.

As a consequence of this orientation in a metal drawing operation, the tool and work surfaces are separated by a distance equal to two lengths of carbon chains. This reduces the tendency toward welding and, in addition, provides slippage as the metal surfaces slide over the mono-molecular film. "Boundary Lubrication" is the term used to describe this condition, where the pressure encountered may be as high as 100,000 psi. This is in contrast to "Hydrodynamic" or thick film lubrication as in the lubrication of bearings, where pressures may be in the order of only a few hundred psi.

The most common oiliness agents are:

1. Fatty Acids — These materials are derived from fatty oils and fats and are usually long straight chain molecules containing a carboxyl polar group at one end. Examples of these substances are stearic acid, oleic acid and palmitic acid.
2. Fatty Oils and Fats — These materials are "glycerides" consisting of chemically combined glycerine and fatty acids. The distinction between fatty oils and fats is that the former are liquid at 68°F whereas the latter are solid. Fatty oils and fats typically possess three long chain carbon groups and associated polar groups. Examples of these substances are tallow, lard oil, castor oil and Neatsfoot oil.
3. Soaps — In its basic conception, a soap is the reaction product of an alkali and a fatty acid. Soaps possess a long carbon chain with a polar and metallic group at one end, such as the sodium soap. Examples of these substances are sodium stearate, potassium stearate, sodium oleate, etc.
4. Waxes — The wax materials used as oiliness agents are "esters" of plant or animal origin, found in nature as chemically combined fatty acids and high molecular weight alcohols, plus an appreciable quantity of uncombined reactants. Examples are beeswax and Carnauba wax.
5. Synthetics — Although the natural fatty materials of plant and animal origin are most widely used as oiliness agents, a variety of modifications have been synthesized. The

Blanks may be lubricated by brush, as shown, drip procedures, rollers immersed in the lubricant, or circulating systems.

more promising of the synthetic group for metal drawing are the partially esterfied glycerides and the polyalkalene glycols. These materials, like the natural compounds used for oiliness purposes, have the usual combination of a long carbon chain and a polar group.

Extreme Pressure Agents (EP) — In the more severe drawing operations, where pressures and temperatures are exceedingly high, oiliness materials become disoriented. Under those conditions, extreme pressure agents are required in the drawing lubricant to prevent welding of sliding surfaces.

An EP lubricant may be defined as any material that tends to prevent moving metal surfaces from welding under conditions of high temperature and pressure. Such materials may perform this function by either chemical or mechanical methods. The chemical types of EP agents release a substance that reacts with the metal surface to form a metallic film that is more resistant to welding than the original metal. Chlorinated and sulfurized compounds are the most widely used EP agents of this type, forming welding-resistant chloride or sulfide compounds respectively on the metal surfaces. The mechanical types of EP agents are chemically inactive but perform their weld-resisting function by physically separating the moving metals. The most widely used of these so-called "spacing agents" or "pigments" are chalk, mica, graphite, and zinc oxide.

The use of chlorinated compounds as chemical type EP agents is rapidly displacing the use of the better known sulfurized products. This is because the newer developments among chlorinated compounds have been found more efficient as anti-weld materials for metal drawing and because thin light color and lack of foul odor appeal to the operator. Furthermore, chlorinated compounds are now available that combine both oiliness characteristics and excellent EP qualities.

Chlorinated compounds are especially useful on stainless and alloy steels. Care must be exercised in their use on carbon steels because of the possibility of partial decomposition to hydrochloric acid and resultant corrosion. Their use on copper alloys may be limited due to surface staining, attributable to the formation of greenish-blue colored copper chloride.

Considerable misunderstanding and confusion exists among press shop operators in regard to sulfur compounds. The sulfur may be present in any of the following forms:

1. Pure Sulfur — This is a yellow powder known as "flowers of sulfur". In this chemically uncombined state, sulfur is highly reactive usually being excessive for most metalworking operations.

INDUSTRIAL REQUIREMENTS

The principal requirements for press drawing lubricants may be covered under the following eight categories:

1. Satisfactory Performance — The drawing lubricant must be capable of "doing the job" with a reasonable degree of efficiency. This requires that the product chosen have adequate oiliness and/or EP characteristics to withstand the pressure of metal deformation.

2. Physiologically Safe — Lubricants containing white lead, carbon tetrachloride, or other toxic material should not be used for obvious reasons. The components of the product should be free from chemicals that have been established as skin irritants, such as chromates. The use of conventional sulfurized and chlorinated additives, often blamed for dermatological difficulties are generally not the direct cause, although some individuals are allergic to these materials. The more common cause of dermatitis is bacteria carried to the skin by the drawing lubricant. The addition of germicides to drawing compounds, especially the water dispersible types, has proved helpful in minimizing these problems.

   Dermatitis may also be caused by defatting of skin. Soap solutions and products containing high concentrations of solvents, such as kerosene, may cause this difficulty. In such cases, the application of a suitable ointment to the skin is recommended.

3. Non-Corrosiveness — "Rusting" is the most common of the various forms of corrosion that may be attributed to the effects of drawing compounds on metal surfaces. Since "rust" is iron oxide (brown or black in color), this problem technically refers to oxide corrosion of ferrous parts only, although the term is often incorrectly used in describing other types of surface conditions. Rusting is most frequently encountered with water dispersible compounds and may be minimized or eliminated by either (a) increasing the ratio of product to water, (b) adding a rust inhibitor to the product or water dispersion, or (c) cleaning the parts after drawing and applying a rust protective coating.

   Greenish or bluish stains noted on the surface of copper and copper alloys (brass and bronze) are attributable to copper soap formation by reaction of the metal with free fatty acids present in the lubricant. This condition can be virtually eliminated by using a product that has a free fatty acid content of 1% maximum.

   White stains on aluminum, zinc and alloys of these metals, (brass and bronze both contain zinc) are attributable to salts formed by reaction of the metal with alkalinity present in most water dispersible products. This problem may be expected if the pH is above 9. The use of water insoluble drawing oils is suggested as a simple solution to this problem.

4. Stability of Lubricant — Inasmuch as products are frequently not used for several months after manufacture, they must possess storage stability.

   Products must be stable in the complete temperature range from the hottest summer day to the freezing conditions of winter. Liquid products should not gel or separate components, nor should solid products "bleed" oil or form hard surface crusts.

   Where fats are used, an inhibitor may be needed to prevent rancidity. Pigmented soap-fat pastes, containing suspended spacing agents, must be of sufficient body so that the dispersed solid does not separate.

5. Ease of Application — A product that requires mixing with a diluent, such as water or mineral oil, should disperse easily and without special equipment. This preferable feature is especially important to operators who are on an incentive basis.

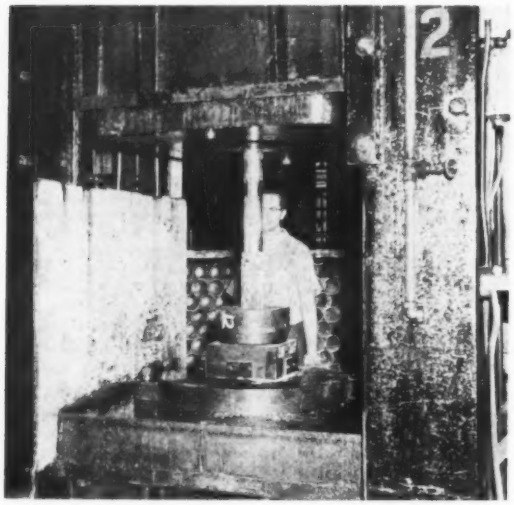
   One of the more convenient methods of applying the lubricant is by continuous circulation to the work. Lubricants suitable for this procedure should be non-foaming.

6. Ease of Removal — The removal of lubricants from drawn parts is generally carried out by means of either aqueous cleaning compounds or solvent degreasing. The former processes are most suitable for the removal of water dispersible drawing lubricants, whereas the effects of solvents are more adaptable to oil soluble products.

7. Weldability — In some cases it is desirable to conduct welding operations on drawn parts before cleaning. The use of certain water-dispersible compounds are most suitable under these conditions.

8. Economy — The only consideration of economy that is valid in determining the cost of production is the "over-all economy". This is the total expense of the metal working operation from start to finish.

   The price of the metal drawing lubricant is one of the smallest and least important of all production costs. Actually, it is merely the cost of the small amount of compound that is retained on the drawn part. Selection of the lubricant that materially reduces over-all production costs can be more than justified.



Severe draws such as required here in the production of gas cylinders often require extreme pressure (EP) lubricants.

2. Sulfurized Mineral Oil — This is prepared by chemically reacting pure sulfur and mineral oil at an elevated temperature. The maximum amount of sulfur that can be combined in this manner is approximately 1½%. These oils are light colored and transparent.
3. Sulfurized Fatty Oils and Fats — These materials are prepared by chemical reaction between pure sulfur and fatty oils or fats at an elevated temperature. Such compounds may be prepared in corrosive or non-corrosive form. The corrosive form contains about 16% sulfur, whereas the non-corrosive form contains about 12%. Sulfurized fatty oils and fats are dark brown in color and are the most widely used sulfur-containing EP additives for drawing compounds.
4. Other sulfurized compounds — These are prepared by a chemical reaction of pure sulfur with fat derivatives, terpenes, etc. This miscellaneous group covers sulfur compounds prepared as improvements over conventional materials with respect to efficiency or as low cost substitutes for sulfurized fats.

The EP characteristics of sulfur compounds vary considerably. Effectiveness of the sulfur compound is dependent upon the so-called "activity" of the sulfur compound as well as the amount of compound incorporated in the product. An active sulfur compound is one which readily releases sulfur under conditions of high temperatures and pressure to form a metallic sulfide on the punch, die and work, providing resistance to welding. Drawing compounds containing active sulfur are termed "corrosive" because the sulfur is sufficiently active to discolor, or form a black stain (copper sulfide) on copper, brass or bronze.

Compounds containing active or corrosive sulfur are more efficient than those containing inactive sulfur. The latter are termed "non-corrosive" because the sulfur will not attack copper, brass or bronze. Accordingly, the corrosive type is employed in drawing ferrous metals and are not suitable for copper alloys.

Among the EP type spacing agents commonly used are the following: chalk, borax, lithopone, zinc oxide, white lead, talc, graphite and mica. The last three named are unctuous and possess lubricating ability of their own. They have been termed "solid lubricants" and cause less lubricating friction but do not pulverize upon being subjected to high pressure, as do the other materials and are therefore probably not as efficient as mechanical separators of sliding surfaces.

Emulsifiers — In the manufacture of water dispersible drawing compounds, some material or group of materials must be added to solubilize water insoluble components in aqueous media. Such materials are called "emulsifiers".

The most widely used emulsifiers are soaps, which also function in the capacity of oiliness agents, as discussed previously. The two principal varieties of soaps employed are sodium soaps and potassium soaps. The latter type gives softer products that are more easily dissolved than the former and are therefore usually preferred for liquid and paste compositions. The sodium soaps are preferred where hard films are desired, as in "dry film" products.

Soaps made from inorganic alkalies, such as the ones mentioned above, leave a residue after heat decomposition or burning. Where a soap is desired that will burn off completely in an annealing furnace, an organic alkali such as triethanolamine may be used for saponification with fatty acid.

Soluble oils usually use a combination of soaps and mineral oil sulfonates or emulsifiers. This is done to give these products a proper balance of properties providing for rapid dispersion of water, rust protection and hard water resistance.

Diluents — A diluent is a low cost material which acts as a "carrier" or "extender" for the more costly and essential components of a drawing lubricant composition. Water, mineral oil and petroleum solvents are the diluents most commonly used.

In addition to their important function of diluting the drawing lubricant composition, diluents help to dissipate the heat formed during metalworking. Where circulating systems are in service, the dissipation of heat may be a more important contribution of the diluent to good lubrication than its service as a cost reducer. Water, in this respect, is the best coolant generally available and is about twice as effective as petroleum oils.

Inhibitors — These are small amounts of frequently complex chemicals that are added to a drawing lubricant composition for the specific purpose of eliminating or minimizing some undesirable property that might otherwise be present. Inhibitors are available for retarding rust formation, foam, bacteriological decomposition, oxidation, etc.

Classification of Lubricants

Finished products for press drawing are classified as either water dispersible or oil soluble, and their uses are indicated in the accompanying recommendation chart. These products can be described briefly as follows:

Water Dispersible Products

1. Soluble Oil — The conventional general-purpose soluble oil is

RECOMMENDATION CHART

	Carbon Steels	Alloy Steels	Stainless Steels	Aluminum	Copper Brass Bronze
Stamping					
Water Dispersible Lubricant	1, 2, 3	3	4	2	1, 2, 3
Oil Soluble Lubricant	6, 7, 10	10, 11	11	6, 7	6, 7, 9
Shallow Drawing					
Water Dispersible Lubricant	3,	4	—	—	2, 3
Oil Soluble Lubricant	7, 10, 11	13	11, 13	7, 8	7, 9
Deep Drawing					
Water Dispersible Lubricant	4, 5	4, 5	—	—	3, 4
Oil Soluble Lubricant	11	11	11, 13	8, 11	8, 11, 12

characterized by the formation of a milky, opaque emulsion when the oil is added to water. Oils of this type are prepared by adding emulsifiers to straight mineral oil. Heavy duty soluble oils, which have EP qualities, have sulfurized or chlorinated compounds added for this purpose. Soluble oils are mixed with water in the ratio of 1:5 to 1:20.

2. Soap Solution — These are concentrated solutions of potassium or sodium soap in water. Such products have the advantages of rapid solubility in water and may be compounded so that they are "self-cleaners" in addition to being lubricants. They provide excellent "slip" and wet metal surfaces uniformly to form an unbroken film. Because of their foaming characteristics, they are not recommended for use in circulating systems.

3. Non-Pigmented Soap-Fat Compound — These products are pastes having the appearance of "Mayonnaise". They consist of approximately 35-60% fat with the remainder being soap and water. The performance given by these products is highly rated and they are among the most popular for moderately severe drawing where a water dispersible product is desired. Usual ratios of product to water are 1:1 to 1:5.

4. Pigmented Soap-Fat Compound — Such compositions are formulated for the more severe drawing operations requiring the use of a water dispersible product. They contain pigment concentrations in the range of approximately 10-50%, the remainder being soap, fat and water. Difficult removal of the pigment from the drawn part in the subsequent cleaning operation presents a serious shortcoming to the otherwise superior performance of these products.

5. "Dry Film" Soaps — These products are among the newer developments in press drawing lubrication. They consist principally of a sodium soap and a water soluble spacing agent, such as borax.
Drawn parts to be coated by "dry film" soaps are immersed in a 10-25% solution of the product at 180-200°F for 3 min and then withdrawn for oven or air drying. The resultant film, which is thin, dry and plastic gives much better lubrication than corresponding aqueous solutions. In addition to the fine drawing characteristics of dry film lubricants, there is less mess at the press, drawn parts are easy to handle and cleaning is comparatively easy for a heavy duty lubricant. Disadvantages include the possible need for special dipping and drying equipment and the adverse effect of high humidity on the film.
It is to be noted that dry film soaps are impractical and needless for drawing small parts. Their principal use is for large area draws such as refrigerator doors, bath tubs or gas cylinders.

Oil Soluble Products

6. Straight Mineral Oil — Inexpensive mineral oil of naphthenic origin having a viscosity of 100-300 Saybolt seconds at 100°F is entirely suitable. In metal drawing, there is no need for the advantages in chemical stability and minimum viscosity-temperature change offered by high quality paraffin or Pennsylvania grade oil.

7. Mineral Oil — Oiliness Blend — These compositions are blends of the aforementioned mineral oil with 5 to 50% of oiliness materials, usually fatty oils.

8. Straight Fatty Oil — The use of Lard oil is most popular because of its efficiency, comparative low cost, availability and liquid state.

9 & 10. Mineral Oil — Sulfurized Oil Blends — These compositions are blends of mineral oil with 5 to 50% of either corrosive or non-corrosive sulfurized compounds, usually sulfurized lard or sperm oil.

11. Mineral Oil — Chlorinated Oil Blend — These compositions are blends of mineral oil with 5 to 50% of chlorinated oil.

12. Straight Sulfurized Oil — Described under the heading of "Extreme Pressure Agents".

13. Straight Chlorinated Oil — Reaction products of chlorine gas with hydrocarbons, fats or waxes to form non-volatile, light colored syrupy liquids.

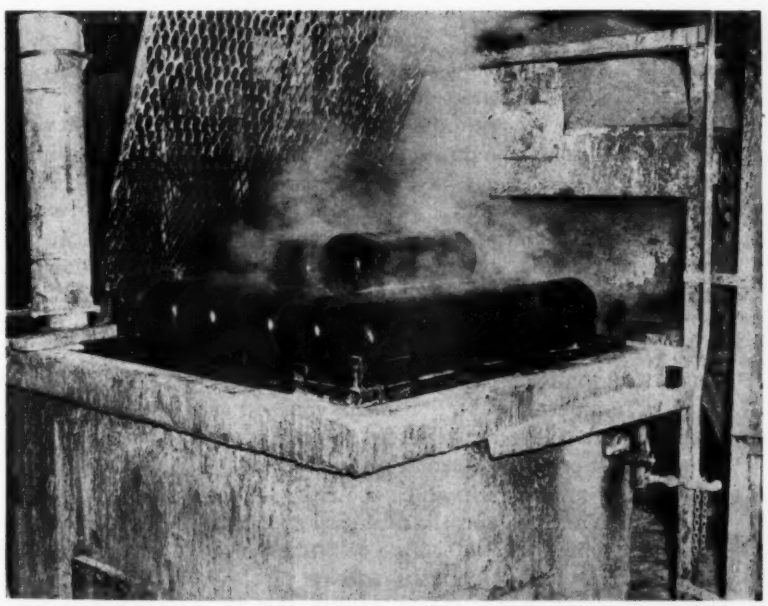
Metal Coatings

A study of press drawing lubricants would not be complete without some mention of special chemical or metallic coatings that are sometimes applied to ferrous metals as an aid to the lubrication process.

The application of phosphate coatings on carbon steel that is to be deep drawn has been steadily gaining popularity. While this process is costly, its use is frequently justified in severe drawing operations. The coating is applied by dipping the cleaned metal in a hot phosphate solution. Inasmuch as phosphorus is a chemical type EP agent, anti-weld protection is enhanced in the drawing operation. In addition, the sponge-like coating produced on the metal as a result of phosphatizing helps hold the drawing lubricant on the metal surface. Oxalate coatings are applied in like manner for stainless steels for similar purposes.

From time to time, soft ductile metals are deposited on alloy steels, especially stainless, prior to drawing for the purpose of reducing the severity of difficult operations. These metal coatings, which are either copper, lead, zinc or tin, enhance the drawability of the base metal and are applied by electrolytic means, hot dipping or chemical displacement.

end



Partially drawn gas cylinders being coated with a "dry film" lubricant by immersion in a hot aqueous solution, preparatory to the next draw stage.

Engineering Cams for Their Production in Limited Quantities

by Ernest C. Sassano
President
SHAKER TOOL AND DIE COMPANY
Cleveland, Ohio

A CAM CAN BE DEFINED as a machine part designed so that its regular motion, either reciprocating or rotating, can be converted into an irregular motion, either reciprocating or oscillating, and imparted to another machine part.

The cam is a most versatile machine part and by its use the machine tool designer has a means of developing complicated movements that are difficult to obtain by other methods.

The volume of cams used in machine building varies from a limited number in some plants to quantities large enough in others to warrant cutting them on a production basis. While these large quantity users find it economical to maintain a cam milling department, there are many other manufacturers who incorporate cams in the machines they build, but not in sufficient quantities to justify specialized cam making facilities. It is to these latter manufacturers that the following suggestions are directed.

It is perfectly natural to assume that a manufacturer will set up an engineering charge against the development of his cam requirements. However, if he sends a cam drawing to a cam specialist without sufficient detail to enable the latter to put it into production, then the project must be re-engineered for which the cam specialist is justified in making an engineering charge. Thus, the cam user is subject to a double engineering charge on his cam.

The cam milling machines in use in our plant are designed to produce cam profiles from master templates. It is our experience at Shaker Tool and Die that, with this method of production, a more accurate and smooth operating cam is produced from a master template when the rise and fall values are laid out on 1° increments. However, the accuracy specified by the customer will determine on what increment the rise and fall values will be plotted, that is, 2°, 3°, 4° or whatever it might be.

These rise and fall values then have to be developed and plotted on a new drawing to give the true cam profile before they can be transferred to the master template.

It is the absence of these plotted values from a customer's print that makes it necessary to re-engineer many drawings that are submitted to us for cam production.

Inasmuch as our cam milling machines produce exact duplicates of the master template contours, we mill all our customers' cams from master templates on which the rise and fall values are laid out on the increments specified.

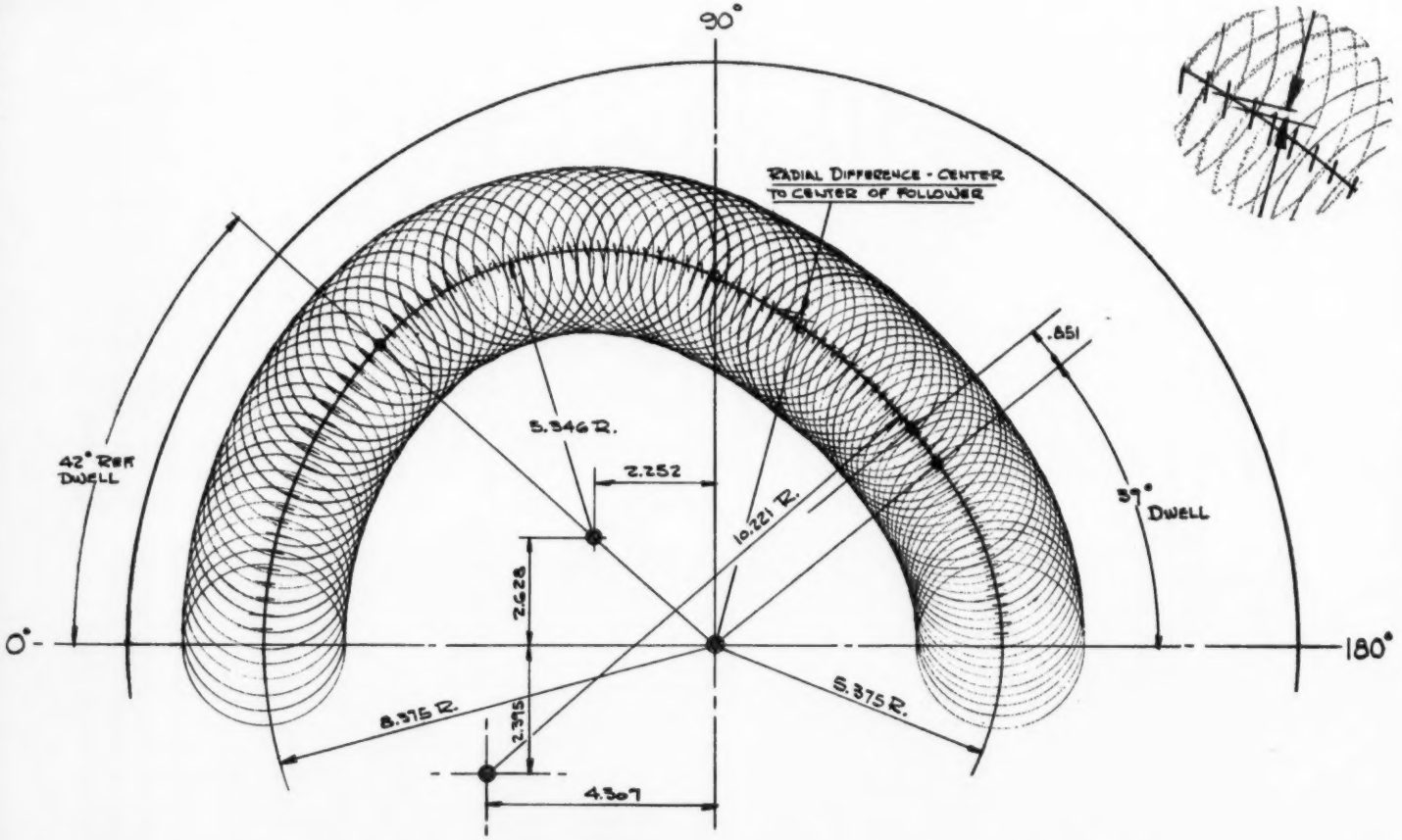
Thus it can be seen that if a customer's print does not show the cam developed on the basis of rise and fall values plotted on the specified increments, then it is necessary for the proposal to be re-engineered so that it will comply with our method of laying out master templates and from which we produce accurately operating cams.

The difference between an accurately engineered cam drawing and one that is inadequate in its detail is shown in Figure 1. For simplification, only half of the cam is shown, with the outer heavy half circle representing the periphery of the cam.

The drawing as received by us showed only four radii dimensions with their centers established from the vertical and horizontal centerlines. Arcs were shown drawn on these radii to indicate the path followed by the center of the follower.

We have surperimposed on this drawing our method of developing the contour path for the required cam.

In laying out this cam, the customer's designer started at the left and drew an arc on the 8.375″ radius, with its center at the center of the cam. This arc represents the centerline of the follower passing through a dwell of 42°. The second arc, drawn tangent to the first with a radius of 5.346″ was swung from a center located 2.252″ to the left of the vertical centerline and 2.628″ up from the horizontal centerline.



DEGREE	RADIAL DIFFERENCE— CENTER TO CENTER OF FOLLOWER (AT PLOTTED POINTS)
0°	THRU 50° — DWELL
52	.040
54	.040
56	.050
58	.050
60	.060
62	.060
64	.060
66	.060
68	.060
70	.070
72	.070
74	.070
76	.070
78	.070
80	.080
82	.080
84	.090
86	.100
88	.100
90	.100
92	.110
94	.110
96	.110
98	.110
100	.100
102	.100
104	.090
106	.090
108	.080
110	.080
112	.070
114	.070
116	.060
118	.050
120	.050
122	.040
124	.040
126	.040
128	.040
130	.030
132	.030
134	.030
136	.030
138	.030
140	.030
142°	THRU 180° — DWELL

Fig. 1. A cam drawing submitted for cam production was limited in its data to the follower centerline developed by a series of tangent arcs scribed from dimensioned centers and radii.

Superimposed on this drawing is the series of circles that were drawn from centers located at 2° intervals on the following centerline. Curves drawn tangent to these circles form the inner and outer walls of the cam track.

The chart to the right of the drawing shows the radial differences — center to center of the follower

Inset shows close-up of radial difference — center to center of follower.

Fig. 2. Barrel cam (positive return type)

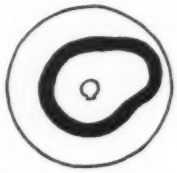


Fig. 3. Box cam (positive return type)

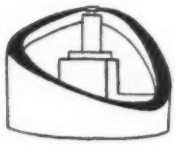


Fig. 4. Side cam (non-positive return type)

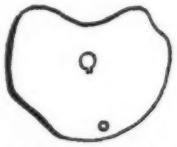


Fig. 5. Face cam (non-positive return type)

The third arc, tangent with the second, has a radius of 10.221″ with its center 4.307″ to the left of the vertical centerline and 2.395″ down from the horizontal centerline. The final and fourth arc, with a radius of 5.375″ was swung from the cam center. A straight line 0.851″ long was drawn tangent to the third and fourth arcs.

As this follower centerline development was the only data submitted from which we were to produce a cam, it was necessary for us to make a new drawing and develop the profile of the follower track. This was accomplished by establishing a series of closely located points that could be connected to form smooth uninterrupted curves, both inner and outer limits of the follower path.

On the follower centerline, redrawn from the data submitted, 2° increments were laid off to serve as centers for a series of circles having diameters equal to that of the intended follower.

These circles are shown superimposed on the drawing in Figure 1. By drawing curves tangent to these circles, both walls of the cam groove were developed.

On this job a 3.00″ dia follower was specified, in which case we used a 3.00″ dia end mill to cut the track.

To accurately develop our master templates, it was therefore necessary to determine the radial differences between the successive circle centers plotted on the follower centerline at 2° increments. A note on Figure 1, "Radial difference — center to center of follower," indicates the procedure in determining this radial difference.

Since our master templates are machined on a jig mill, these center-to-center radial differences, or drop values, are necessary to guide the operator in setting up his machine.

For most purposes these values can be scaled; however, if an extremely accurate cam is specified, the value for each point can be computed by means of a rather long and involved formula. To facilitate accurately scaling these radial difference values, we make our layouts 10 to 20 times normal size, choosing whichever is practical.

The accompanying table at the right shows the drop values between the circle centers on the follower centerline. These values start at the 50° point, end of the dwell, through to the 142° point, stopping at the beginning of the dwell that runs to the 180° point.

It should be noted that the difference between the 8.375″ radius of the track at the left, and the 5.375″ radius at the right, is 3.00″. Adding up the drop values in the chart results in 3.00″. Stress is laid on the importance that these two values must be the same.

There are two types of cams in general use — positive return and non-positive return. It is recommended that positive return cams always be used wherever possible if sufficient space is available. Figure 2, barrel cam, and Figure 3, box cam, are two of the positive return types. Figure 4, side cam, and Figure 5, face cam, are non-positive return types. Some arrangement, such as a spring, has to be used with non-positive return cams in order to hold the follower against the cam track, whereas the follower has to follow the cam track in the positive return types.

It is further recommended that in designing hardened positive return cams, the web where the track approaches most closely to the periphery be made as thick as possible. Experience has shown that when hardening cams with a web too narrow, the cam track will either open up or close in, depending on the specific design of material used.

The box cam shown in Figure 3 illustrates the condition of a narrow web between the cam track and the periphery of the cam.

To correct distortion, where the track closes, grinding can be resorted to, but grinding is an expensive operation and should be avoided unless absolutely necessary. It is more economical to use a higher quality of steel, since the cam has a better chance of remaining uniform in the hardening process.

Master templates developed in our plant are made (unless otherwise specified) to a standard radial tolerance of 0.0005″ total. These templates will produce, on our duplicating mills, cams held to a total tolerance of 0.002″. The 0.002″ tolerance is ample in 95% of cam applications.

end

Dial Type Operating Conveniences

help the operator improve his performance

CINCINNATI

Ask the man at the machine. He'll tell you that built-in operating conveniences have a direct tie-in with costs. For example, consider a much appreciated Dial Type convenience like identification disks on control knobs. They jog the operator's memory; help him avoid wrecks between the cutter and work or fixture. Other CINCINNATI® Dial Type operating conveniences include:

Push-button selection of spindle speeds; in increasing or decreasing steps

Power feed change; in increasing or decreasing steps

Independent, directional controls; with palm-fitting plastic knobs

Dynapoise chatter-damping overarm; greatly reduces the noise of cutting action

Safe to operate; all hand cranks automatically disengaged when power feed or rapid traverse is engaged

Complete rear controls (Plain and Universal machines)

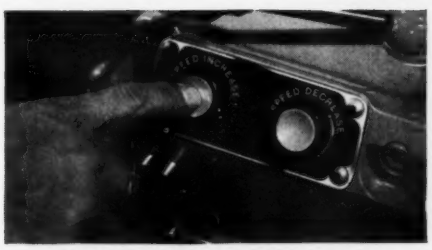
These are but a few reasons why Dial Type Milling Machines are tops with the operator. Want more information? Look in Sweet's Machine Tool File for brief specifications; complete data in catalog No. M-1915-2.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Brief Specs, Dial Type Milling Machines

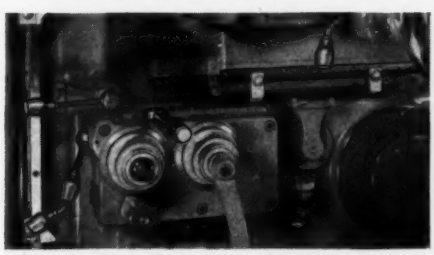
DIAL TYPE LINE		table traverse	main drive	automatic table cycles available
No. 2	Plain	28"	10 hp	yes
	Universal			no
	Vertical			yes
No. 3	Plain	34"	15 hp	yes
	Universal			no
	Vertical			yes
No. 4	Plain	42"	20 hp	yes
	Universal			no
	Vertical			yes

Identification disks on all control levers



Push-button selection of spindle speeds

Power selection of feeds, ⅜ to 90 ipm



Rear operating controls are duplicates of those located at front of machine. (Plain and Universal styles)

CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS
METAL FORMING MACHINES • HARDENING MACHINES • OPTICAL PROJECTION
PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

CIRCLE INFORM-A-GRAM KEY NO. 95

Superior Quality, Retained in YOUR Product . . . UDDEHOLM Strip Steel

Quality of materials is something that will always show up in the final product. So why not take advantage of the extra quality available in Uddeholm Swedish Strip Steel. For, besides transferring its inherent quality to *your* product, such a steel can seriously lessen production problems and rejects.

Reasons for Uddeholm Strip Steel "quality" are easy to explain. As a raw material Uddeholm uses famous Varmland iron ore, world-renowned for its exceptional purity. Added to this is a traditional craftsmanship in steelmaking almost three centuries old—where only the finest steel is accepted. Final perfection is guaranteed by a selective system of rigid inspection.

In terms of your application, then, this means cold-rolled strip steel of consistent uniformity, undeviating flatness, and fine finish—with straightness of edges and accurate dimensional tolerances throughout. And these features are combined in the grade, finish and dimensions you need, whatever your requirements. Widths range from ⅛″ to 16¼″, thicknesses from .001″ to .125″. Tolerances as close as ±.00008″ are possible. Slitting and edging facilities are also available.

Uddeholm Strip Steels appear in countless applications, including Stainless Steel products, stampings, intricate machine parts, all types of blades and springs, and many others. For quick delivery just phone us your needs.

Write for latest Strip Steel Stock List

UHB

UDDEHOLM COMPANY OF AMERICA, INC.

Tool and Die Steels
Specialty Strip Steels

Offices and Warehouses

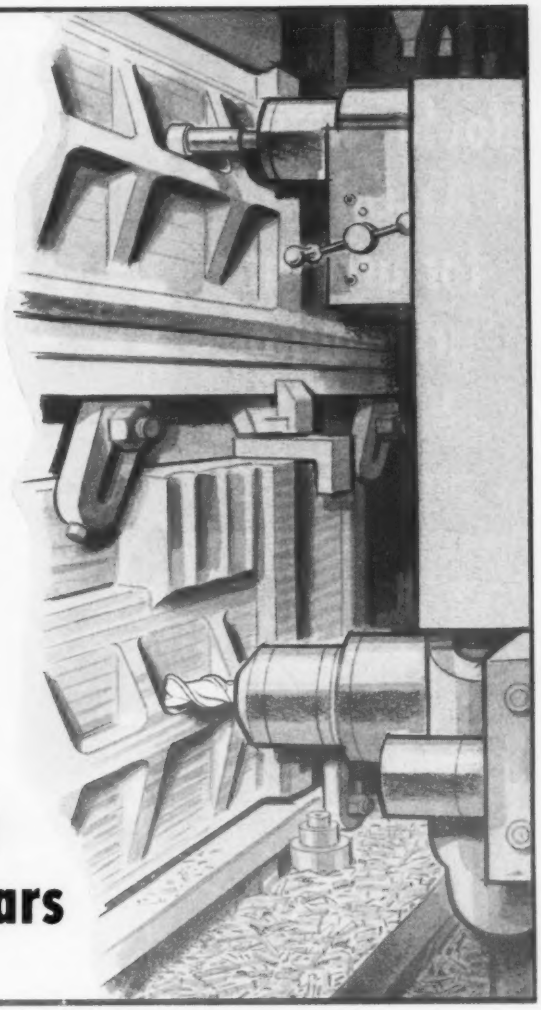
New York: 155 East 44th Street, MUrray Hill 7-4575
Cleveland: 4540 East 71st Street, DIamond 1-1110
Los Angeles: 5037 Telegraph Road, ANgelus 2-5121

District Representatives

CHICAGO Frank J. Mackin, Leroy E. Marshall, 55 East Washington, STate 2-1649 DETROIT: Warren H. Nugent, 17304 Lahser Road, KEnwood 5-6340
PHILADELPHIA: Frank T. Campagna, 34 South 17th Street, RIttenhouse 6-4290

CIRCLE INFORM-A-GRAM KEY NO. 96

CLEVELAND
Hy-Spiral End Mills



cut the cost of milling 75 ST aluminum wing spars

CLEVELAND Hy-Spiral End Mills have increased production from 12 to 37½ spars per grind. They have eliminated tool breakage, and have greatly reduced the build-up on side and end cutting edges. ◈ CLEVELAND Hy-Spiral End Mills were developed primarily for aircraft forging tracer milling. They have the right combination of rake, relief and helix angles to provide the proper shear cutting action for fine finishes and long tool life in non-ferrous materials. They also give excellent results in many ferrous applications. ◈ For full information about these *high performance* end mills, contact our nearest Stockroom, or . . .

Request your copy of this helpful, informative book that describes the complete line of CLEVELAND End Mills

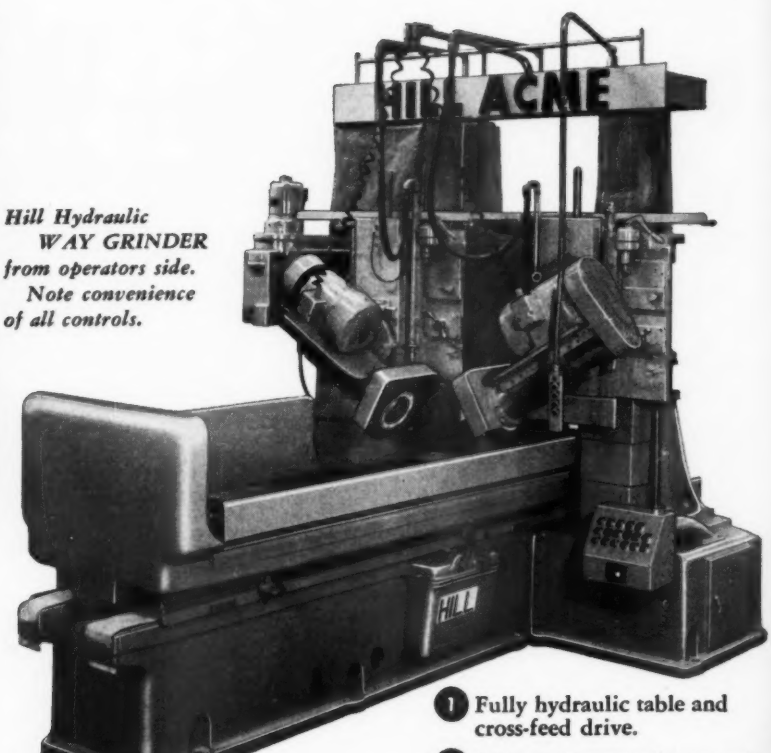
TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58 • E. P. Barrus, Ltd., London W. 3, England

CIRCLE INFORM-A-GRAM KEY NO. 97

HILL double housing WAY GRINDER for accurate grinding of V's, Flats and Angles

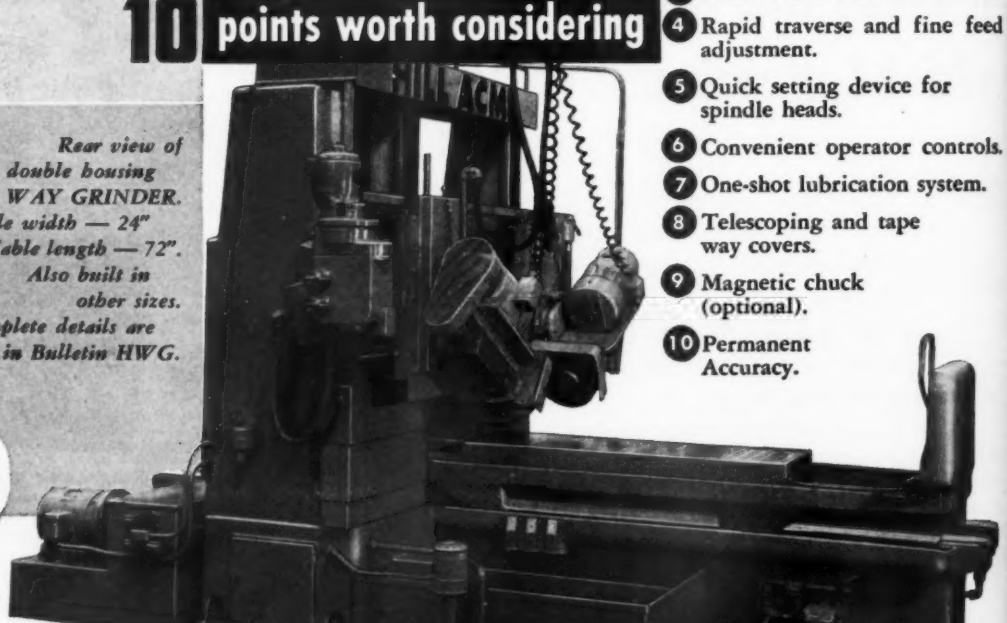
Substantial Savings (up to 50%) over previous methods.



Hill Hydraulic WAY GRINDER from operators side. Note convenience of all controls.

10 points worth considering

1. Fully hydraulic table and cross-feed drive.
2. Independent spindle operation.
3. Massive over-all construction.
4. Rapid traverse and fine feed adjustment.
5. Quick setting device for spindle heads.
6. Convenient operator controls.
7. One-shot lubrication system.
8. Telescoping and tape way covers.
9. Magnetic chuck (optional).
10. Permanent Accuracy.



Rear view of HILL double housing WAY GRINDER. Table width — 24" Table length — 72". Also built in other sizes. Complete details are given in Bulletin HWG.

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

CIRCLE INFORM-A-GRAM KEY NO. 98

FALCON

KWIKLOK

QUICK CHANGE HOLDERS

with T. I. DRIVE

PAT NO 2612377

Decidedly New!

OUR—ADAPTERS—Will take SHELL END MILLS, BROWN & SHARPE And MORSE TAPERED SHANK STANDARD DRILLS & REAMERS, STRAIGHT SHANK END MILLS, JACOBS CHUCKS, FLYNN OFFSET BORING HEADS, FALCON T.I. DRIVE STANDARD INTERCHAIN GEABLE COUNTERBORES, SOLID BORING BARS, FLOATING TAP HOLDERS & ETC.

you have waited for...

—YOU—Can have our latest Brochure just for the asking. It will give you all the PERTINENT ENGINEERING DATA You will want.

WRITE FOR YOUR COPY TODAY

Just what

-FALCON-

WIKLOK-HOLDERS

re the quickest of the quick.

ade with NATIONAL STANDARD
APERS, BROWN & SHARPE, MORSE
ETC.

FALCON

Mailing Address: P. O. Box 4605
Mt. Elliott Station, Detroit 34, Mich.

t Address: 20771 Ryan Road

END MILLS • FORM RELIEVED CUTTERS • REAMERS • MILLING CUTTERS SPECIAL TOOLS • MULTIPLE DIAMETER STEPCUTTERS • T. I. DRIVES ON ALL TYPES OF SHANK TOOLS • COUNTERBORES • KWIKLOK QUICK CHANGE TOOL HOLDERS, ADAPTERS AND ETC.

The COST of a drill bushing depends on

MEN YOU SHOULD KNOW

John J. Fajnor has been elected vice president of Brad Foote Gear Works, Inc.

◆

Firth Sterling Inc. has announced the appointment of **Malcoln F. Judkins** as director, new product development. **J. Mabon Childs** has been named as product manager in the Steel Division of the company's Sales Department. He will be wholly responsible for the sale of zirconium products and partially in charge of the sale of titanium and induction vacuum melted alloys.

◆

The new field secretary of the National Tool & Die Manufacturers Assn. is **William E. Arnold.** He will headquarter in Cleveland.

◆

John H. Diehl has been named assistant to the vice president in charge of the Power Tool Division of Rockwell Mfg. Co.

◆

The new general manager of Lipe-Rollway Corp. is **Robert M. Zimmerman.** In his new position, he is responsible for all operating functions for the company's heavy-duty clutch and machine tool divisions.

J. R. Silverman has become executive assistant to the vice president—production of Chance Vought Aircraft, Inc.

◆

Edwin W. Munson has been appointed special product development engineer for the Air Gage Division of Dearborn Gage Co. His new responsibilities include development of air, air-electric, and air-electronic gaging equipment.

◆

Preston D. Liebig has joined J & S Tool Co., Inc. as chief engineer.

◆

Howard W. Merrill has become a vice president of The Martin Co. and general manager at Baltimore. He succeeds **William B. Bergen,** who retains his position as executive vice president. Mr. Merrill has been with the company for 11 years.

◆

The Super Tool Division of Van Norman Industries, Inc. has announced the appointment of **Milton J. Steffes** to vice president, sales and engineering, and **L. B. Szal** to vice president, production. Mr. Szal will be in charge of production at the three Super Tool plants at Detroit, Elk Rapids, Mich., and Los Angeles. Mr. Steffes has been associated with the company for 15 years.

Edward H. Rofe has taken over as chief engineer of Sahlin Engineering Co., Inc.

◆

Temco Aircraft Corp. has named **Vernon N. Ferguson** as vice president in charge of manufacturing operations for all plants. **John A. Maxwell, Jr.,** has been promoted to vice president in charge of sales and contract administration for the corporation.

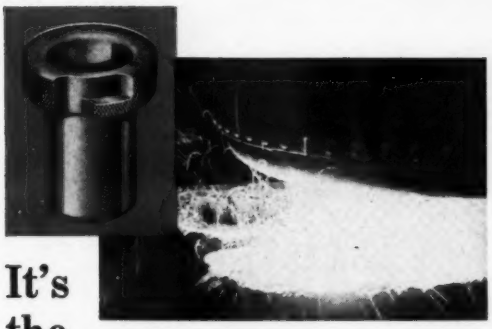
◆

Henry S. Harrison has become plant superintendent for the machine and tools division of Michigan Tool Co. He will supervise manufacturing operations of the company's 6 Mile Rd. plant. Mr. Harrison joined the company in 1924. He is being replaced as plant superintendent of the newly formed Gear-O-Mation Division by **Al Combs.**

◆

National-U.S. Radiator Corp. has announced that **Robert A. Allwein** and **Franklin Y. Reiter** have moved to the company's Duncansville, Pa., plant as superintendent and plant manager, respectively.

its working LIFE!



It's the *steel* in ACE drill bushings... *that makes the difference!*

When working life is doubled . . . bushing costs are cut in half! Fewer bushing changeovers add *bonus production savings!* That's why ACE drill bushings of new high-carbon chromium steel are being *specified exclusively* by cost-conscious tool men everywhere! Make a *working comparison* NOW with any other make bushing . . . and see "Positive Proof" that *the steel makes the difference!*

Write for the all new 1957 ACE Catalog and the name of your nearest distributor.

ACE DRILL BUSHINGS

ACE DRILL BUSHING CO., INC.
5407 FOUNTAIN AVE., LOS ANGELES, CALIF.
ACE DRILL BUSHING CO. EASTERN DIVISION INC.
611 McCARTER HWY., NEWARK 5, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 101

MEN YOU SHOULD KNOW

Appointment of **Glenn A. Sterzbach** as master mechanic has been announced by The George L. Day Co. He will be in charge of manufacturing and service of the special presses, machines, and component units produced by the company for the metalworking, powder metal, abrasive, refractory, and ceramic industries.

◆

Carl L. Bobzin is serving as a senior tool design engineer for The Maytag Co.

◆

Jarvis Corp. has made known the appointment of **Ernest F. Dooley** as carbide tool engineer.

◆

A. Robert Stone has been named assistant general manager of Stone Machinery Co.

◆

William J. Slachta has taken over as superintendent of the Oldsmobile final assembly plant for General Motors Corp. He succeeds **M. J. Minno,** who has retired.

◆

Election of **Emerson L. Claussen** as vice president in charge of standard products sales of Standard Screw Co. has been disclosed.

The election of **Carleton Ellis, Jr.** as president and chief executive officer of Cavitron Equipment Corp. has been disclosed.

◆

George Gutekunst, Charles Rieman, and **Brice D. Maddox** have become vice presidents of Gardner-Denver Co.

◆

Albert M. Dexter has been named assistant to the manager of the Gage Division of Pratt & Whitney Co., Inc. In addition, he is representing the company in a joint effort with the National Bureau of Standards to devise means to accurately measure one-tenth of a millionth of an inch. **Arthur H. Wolfson** has moved into the position of manager of gage research.

◆

John E. Montgomery has been named general manager of the Tool & Die plant, a division of W. A. Sheaffer Pen Co.

◆

The new president of The Allen Mfg. Co. is **Malvern J. Mather.** He succeeds **James G. Osmond,** who has retired.

C. William Miller has joined the executive staff of Volkert Stampings, Inc. He will be on special assignment.

◆

Flick-Reedy Corp. has made known the appointment of **Thomas E. Wood** to the position of director of programming and development. He will direct employee and salesmen communications and conduct training programs.

◆

Arthur T. West has been named president of National Tool Co. and **R. D. Lindstrom** has been elected vice president and general manager.

◆

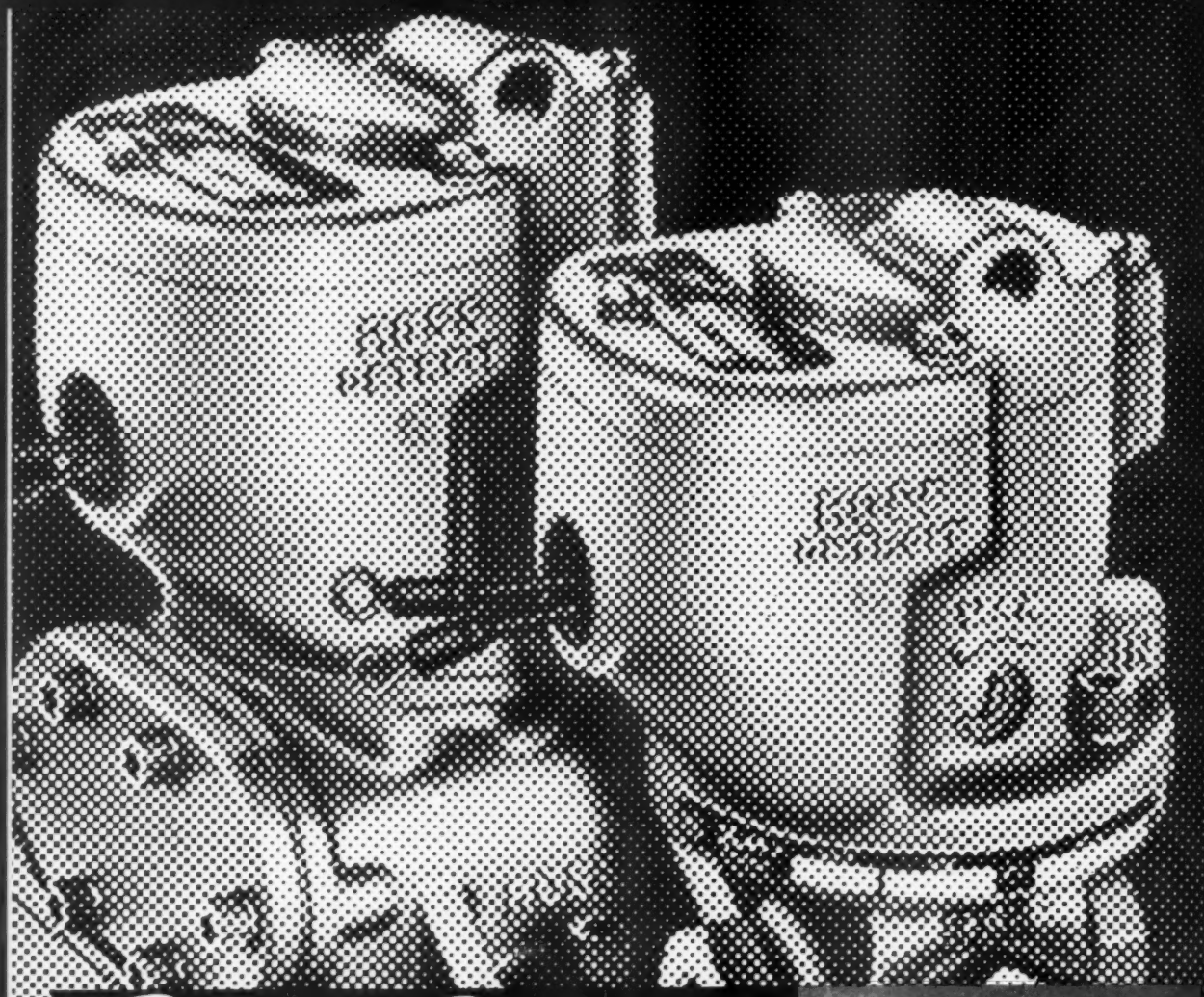
The new president of Tube Reducing Corp. is **A. J. Williamson.**

◆

The new president of The Babcock & Wilcox Co. is **M. Nielsen.** He succeeds **Alfred Iddles,** who has retired.

◆

William D. Ross has become president of J. J. Tourek Mfg. Co. **R. A. Burritt** has taken over as vice president and factory manager. Mr. Burritt has been connected with the design and production of screw machine products for over 30 years.



Ross Skyline

Silvermodel JIC Spool Solenoid

Any Skyline Head Attaches to Any Skyline Valve Body

Interchangeable! 25 Million Cycles in Tests!

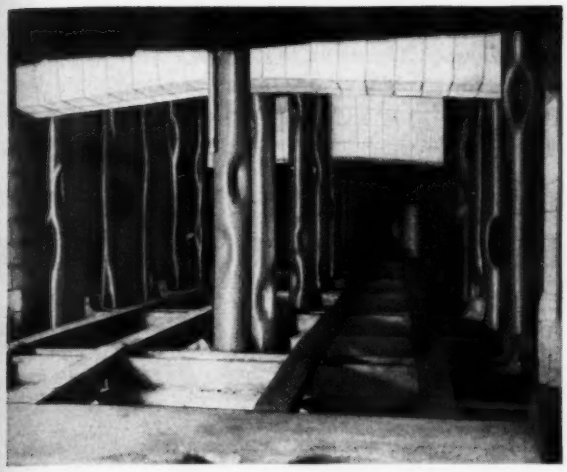
Now the JIC spool solenoid valves join the Ross Skyline. Now six actuating heads and seven in-line and base mounted bodies—all completely interchangeable—give you any valve you want in this series designed especially to last millions more cycles than ordinary valves. But, these quality valves come to you at *sensible* prices! For instance, the ⅜" Silvermodel base mounted, 4-way is only $62.50 complete, and complies with all JIC requirements. Write for bulletin 315.

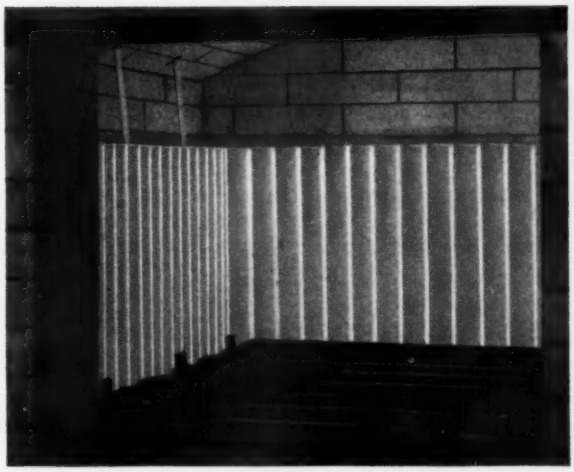
Ross OPERATING VALVE COMPANY

123 EAST GOLDEN GATE AVENUE • DETROIT 3, MICHIGAN

Whatever your source of heat...

LINDBERG HEAT TREATING FURNACES OFFER THESE EXCLUSIVE ADVANTAGES





. . . IN THE GAS-FIRED FURNACE
NEW LINDBERG VERTICAL RADIANT TUBE

Because of its revolutionary design, this tube provides a new level of gas-fired furnace performance. The secret lies in the new Lindberg tube's "dimples." The tube carries a central stream of mixed air-and-gas surrounded by a cylindrical stream of air alone. Combustion occurs in the area between these two streams. The "dimples" create eddies accelerating combustion and maintaining even temperatures along the entire tube.

This Lindberg tube will operate at maximum efficiency for a longer period of time. The special protective coating gives greatest possible resistance to carbon penetration. Vertical position eliminates soot deposit and resultant temperature increases at points of sooting.

Tubes are 59 inches long, weigh only 29 pounds, changeable in a few minutes. No costly furnace shutdowns nor high labor and material cost for tube changes.

. . . IN THE ELECTRIC FURNACE
NEW LINDBERG CORRTHERM ELEMENT

CORRTHERM, Lindberg's radically advanced new electric heating element offers advantages never before available for heat treating furnaces. With this new element carburizing and carbonitriding with electricity becomes practical, efficient and economical. Ideal, too, in other types of Lindberg electric furnaces.

The outstanding feature of the CORRTHERM element is the extremely low voltage at which it operates. Consequently, leakage through carbon saturation and shock or short hazards are eliminated. Elements also act as baffles to direct circulation of convection streams.

CORRTHERM elements are practically indestructible. Work load or operator's charging tool can't hurt them. Watts density is at all time low. Easily installed or replaced, too, as element merely hangs in furnace and no complicated mountings are required.

Lindberg Field representatives in 21 cities are ready to show you how Lindberg furnaces with these revolutionary new elements can improve your heat treating process. You'll find your Lindberg representative's name in the classified section of the phone book or write us direct.

LINDBERG FURNACES

LINDBERG ENGINEERING COMPANY
2445 W. Hubbard Street • Chicago 12, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 103

Cincinnati Press Brake Dies

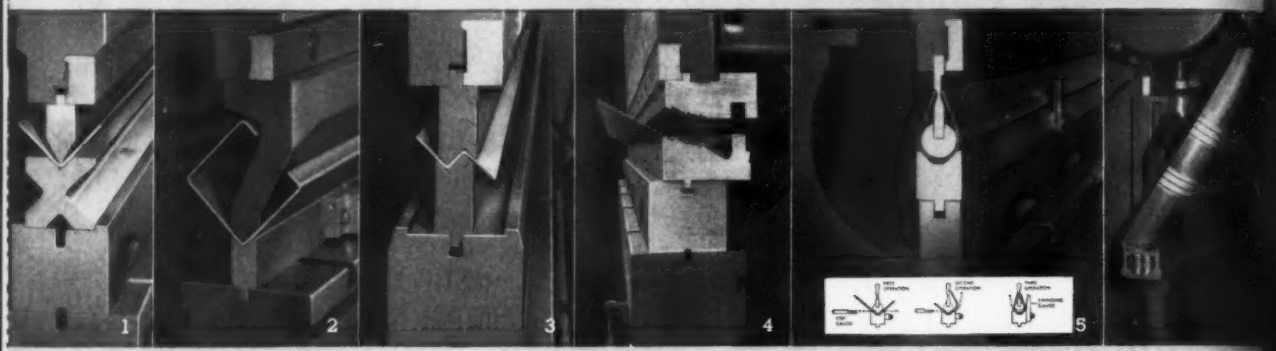
COMPLETE DIE SERVICE

The problem of selecting the proper die is constantly recurring, and many times calls for the best technical skill and accumulated experience available. The Cincinnati Shaper Company offers complete facilities for manufacturing hundreds of dies, for the forming of a variety of products. Also available are the prompt services of our Application Engineers, a department thoroughly experienced and equipped to engineer the special dies you may require.

APPLICATION ENGINEERING DEPARTMENT

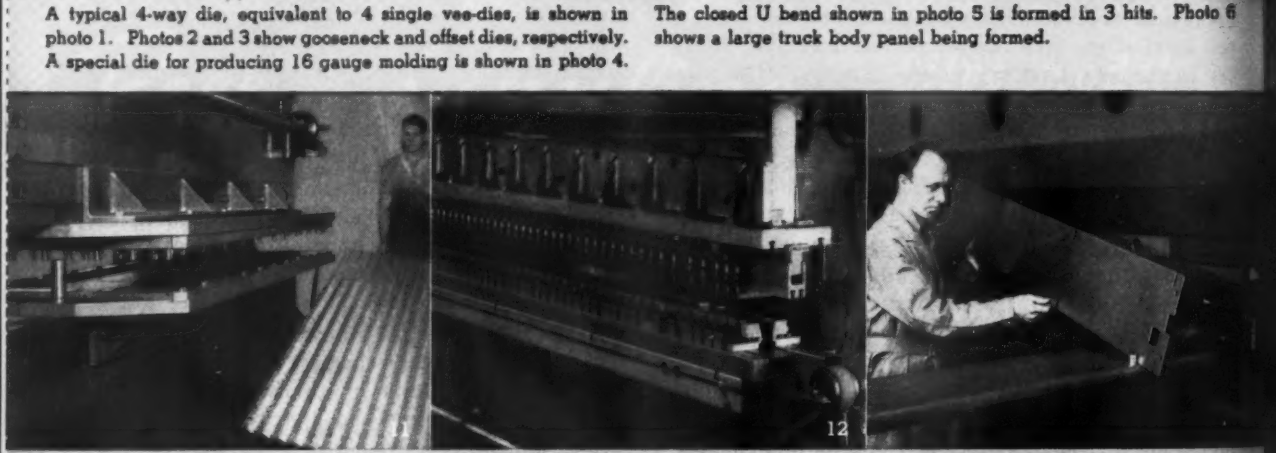
Our Application Engineers stand ready to give your production problems individual attention. They will aid you in the selection of proper punching equipment, if punching is your problem. A background of 30 years of widely varied experience is represented in this department, in literally every field associated with our machines.

To permit our Application Engineers to be of maximum service, as much information as possible should be given when sending us an inquiry or an order. Small details such as angles and radii on even the simple dies depends on such data. With complete information we will be able to make sound recommendations on methods



A typical 4-way die, equivalent to 4 single vee-dies, is shown in photo 1. Photos 2 and 3 show gooseneck and offset dies, respectively. A special die for producing 16 gauge molding is shown in photo 4.

The closed U bend shown in photo 5 is formed in 3 hits. Photo 6 shows a large truck body panel being formed.



Tooling for punching grain bin sheets is mounted on special bolsters in photo 11 Spring plungers are used for strippers. Photo 12 shows a double row punching setup. Gags are used to give different hole groupings. Four edges of a control cabinet blank are punched and notched on the setup shown in photo 13.

CINCINNATI

THE CINCINNATI SHAPER CO.

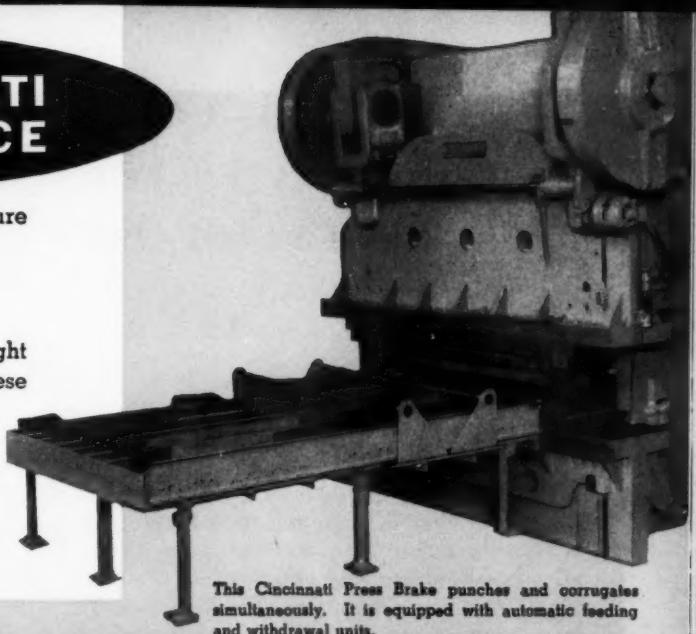
CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

A COMPLETE CINCINNATI ENGINEERING SERVICE

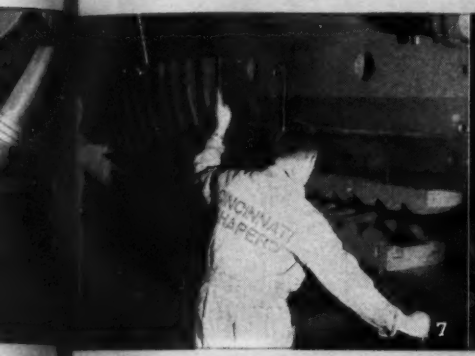
and die design, as well as an estimate of the pressure that will be required.

DIE MANUFACTURING

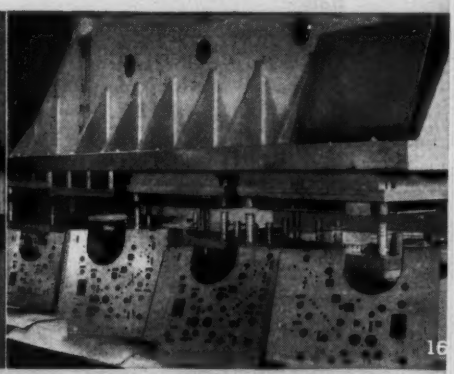
Dies cannot be classified as "standard" even for right angle bends, since there are many designs for these dies alone. Therefore, we do not stock finished dies. Instead, we carry a large stock of brake die steel. Our machining, assembling and testing facilities are ample for producing high quality, fully tested dies for any Press Brake work.



This Cincinnati Press Brake punches and corrugates simultaneously. It is equipped with automatic feeding and withdrawal units.

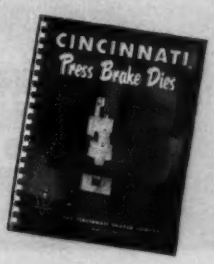


The dies shown in photo 7 form corrugated culvert sections in successive hits. Photo 8 shows conical sections being formed with standard dies. Steel roof decking is made with the "double-decker" dies shown in photo 9. The setup shown in photo 10 produces 2 miles of galvanized gutter per hour.



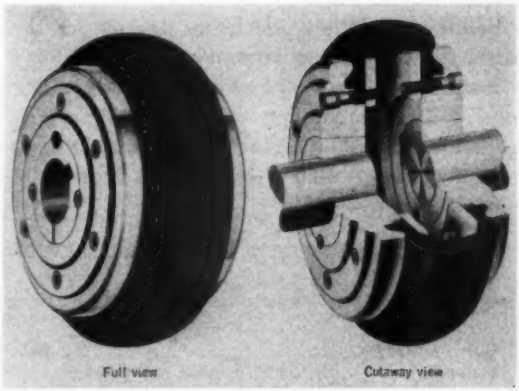
The progressive die setup shown in photo 14 is used for punching and drawing switchboard parts. Photo 15 shows a progressive die setup for making refrigerator top components. Pressure for draw operation is provided by rubber cylinders. Photo 16 shows a progressive die setup for producing television chassis.

The photos on these two pages show just a few samples of the Press Brake tooling and material-handling equipment designed and furnished by the Cincinnati Shaper Company. For more information, write Department T for Catalog D-2.



CIRCLE INFORM-A-GRAM KEY NO. 105

New Flexible Coupling Compensates for Misalignment of Shafts

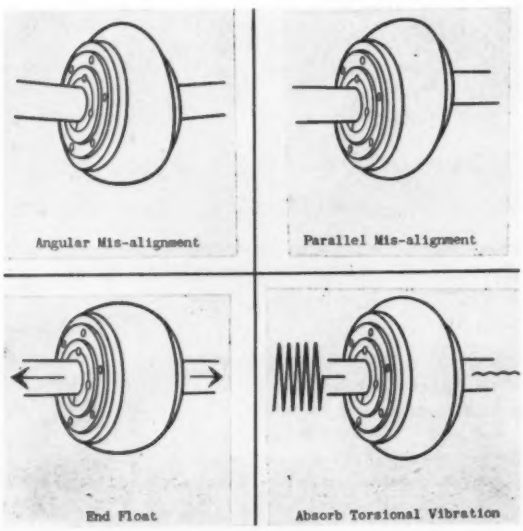


PARA-FLEX, described as a wholly new conception in flexible couplings, transmits power effectively despite angular misalignment, parallel misalignment and end-float, or any combination of these conditions. The flexible member also cushions shock loads and diminishes torsional vibration, thus protecting both the driver and the driven machine.

Heart of the Para-flex coupling simulates a tire, with synthetic tension members bonded together in rubber. This West Germany development, introduced in this country by Dodge Manufacturing Corporation, has been made possible by the technological advance in the manufacture of modern automobile and truck tires, engineered to carry tremendous loads at high speeds and stand terrific shocks.

The four-way flexing body of Para-flex operates with the simplicity and dependability of a modern tire. In addition it has other highly desirable features of installation and maintenance.

The coupling consists of the flexible tire clamped between two hubs, which are mounted on the shafts to be coupled. The flexible member is held between the flanges and clamp rings of the hubs.



Both hubs are machined to take Taper-Lock bushings. These give the equivalent of a shrink fit on the shaft and permit quick and easy application to shafts of different diameters without costly reboring.

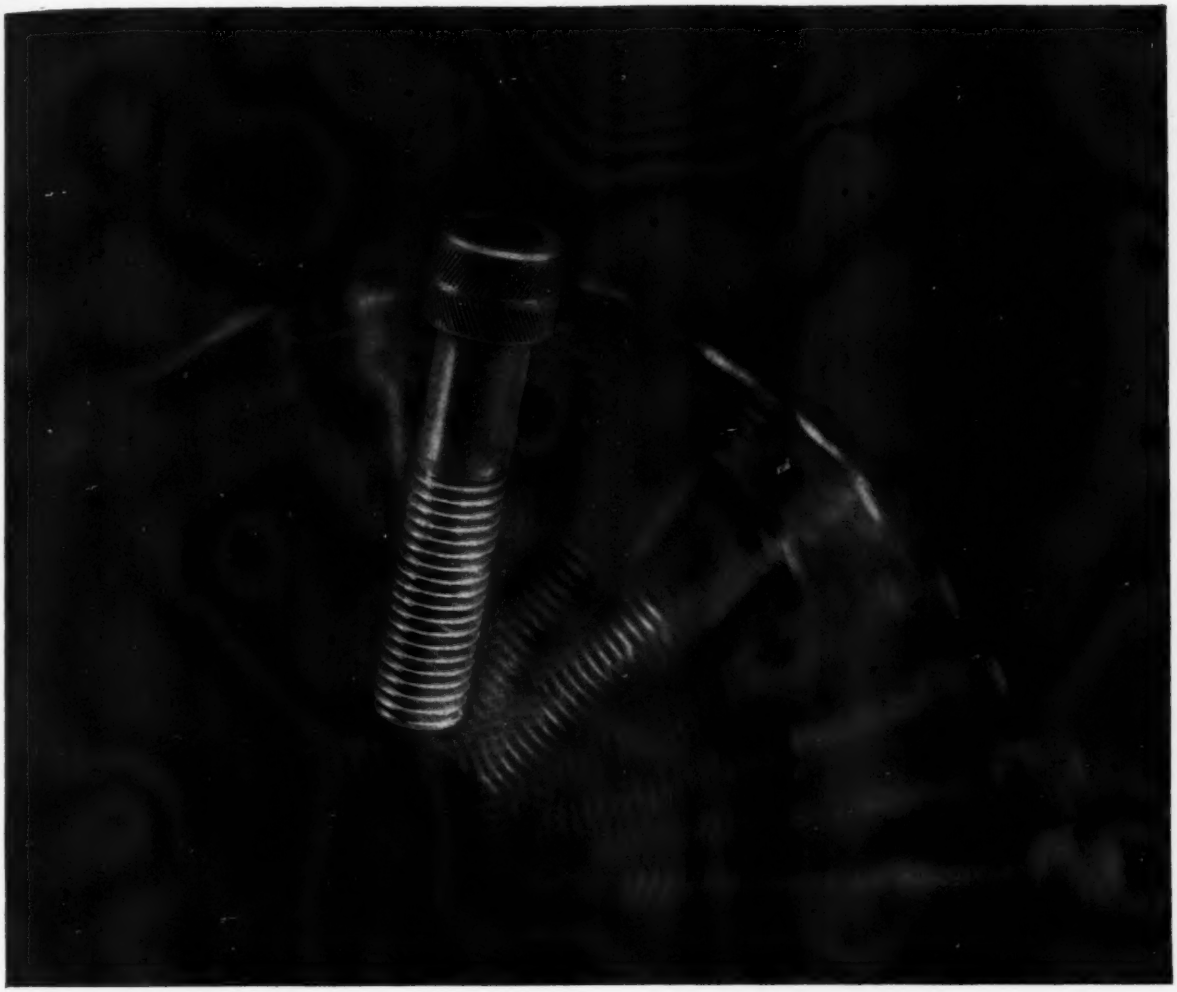
The tire has a transverse split molded into it, which permits easy installation and makes replacement possible without moving driver or driven machine. To make a change it is only necessary to loosen the cap screws enough to allow removal of the tire and fit a new one in place. This can be accomplished in a few minutes.

According to Dodge engineers, Para-flex will take angular misalignment up to 4°, parallel misalignment up to $\frac{1}{8}$", and end-float up to $\frac{5}{16}$" — contingent upon the size of the coupling and the duration of the conditions — or it will take all of these simultaneously.

Because there is no metal-to-metal contact in the Para-flex coupling, it requires no lubrication. No maintenance or regular inspection for lubrication is needed. Safety is promoted by flush design — all cap screws are countersunk, metal surfaces are finished all over, there are no protruding parts. The coupling is designed to occupy a minimum of space on the shaft.

Para-flex has already been proved in thousands of installations in West Germany. Dodge has adapted it to the standards of American industry.

end



There's a good reason why CHICAGO socket screws "roll with the punch"

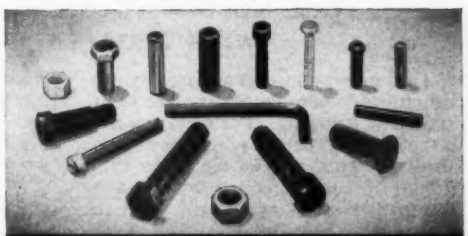
Strange as it seems, the hardest fastener or one with greater tensile strength can be the weakest part of your product. Why? Because excessive hardness results in a brittle fastener that is more susceptible to failure under sudden shock.

At CHICAGO, *proper* hardness is a mighty important phase of our metallurgical quality control. Through years of specialized experience, we've found the hardness range that produces a fastener with just the *right* amount of elasticity to withstand severe shock and vibration. Constant testing assures *every* fastener has this hardness . . . one of many reasons CHICAGO screws are the most dependable you can buy.

For help on all your fastener problems, call your CHICAGO distributor. He's your direct line to 85 years of fastener experience.

THE CHICAGO SCREW COMPANY

DIVISION OF STANDARD SCREW COMPANY • ESTABLISHED 1872
2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS



It pays to standardize on **CHICAGO** FASTENERS

CIRCLE INFORM-A-GRAM KEY NO. 107

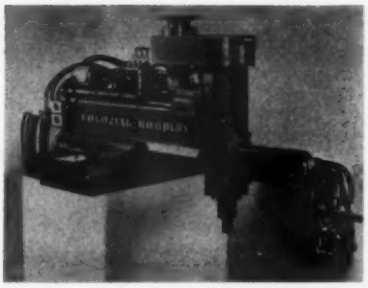
CONTOUR MILL HANDLES JOBS RANGING FROM SMALL DIES TO AIRCRAFT PARTS

Hydro-Cycle contour mills are now being built by the recently formed Colonial-Romulus Division of the Colonial Broach and Machine Company.

The Hydro-Cycle machine is a hand-guided contour mill that is available either as a complete machine or as a contour milling unit for "building block" erection. Both types are designed and built to contour mill a broad range of metals with an exceptional degree of accuracy. Applications range from small forming dies to aircraft components.

Using a hand-controlled tracer, the Hydro-Cycle contour mill is designed and built to perform contour milling operations easier, in a broad range of metals to exceptional accuracy.

Hand control of the tracer stylus attachment offers a true "feel" of the work so that irregular contours can be cut without complex equipment. In die work, it eliminates expensive "barbering" operations. Tracer and template are offset for operator convenience and safety. Micrometer adjustments accurately control the desired relationship between master and workpiece. The tracer attachment can be furnished with single dimensional (depth), 2-dimensional (360°) or 3-D control.



The "Erector" model of the Hydro-Cycle line of contour mills is basically the same as the complete machine but for higher versatility. It is a complete contour milling unit with integrated tracer.

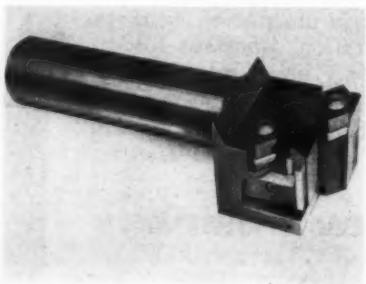
Spindle speeds are infinitely variable in a range of 40 to 3000 rpm. Full horsepower is available at all spindle speeds.

In the "Erector" model, the Hydro-Cycle is offered as a complete contour milling unit for individual mounting or multiple setups on a common base. Fully equipped, the unit is basically the same as the complete machine but is designed for lighter requirements and versatility. Cross travels range from 12" to 36" with vertical travel of 8". Longitudinal travel lengths are offered to suit the application.

TOOL HOLDERS COMBINE THROW-AWAYS WITH SLUG TYPE INSERTS

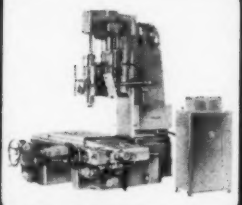
Throw-away inserts apparently are not going to completely replace tools requiring grinding. For instance, use of both slug type (on-end) inserts and throw-away types in the same tool holder is recommended by Wesson Company, for operations where grooving is to be combined with such operations as turning or chamfering.

Shown here is a typical new Wesson Multicut tool holder employing both types of inserts. Two of the inserts are square throw-aways and are used for chamfering a transmission gear in two places. The other insert, of the slug type, is used for cutting a groove in the same gear. The slug type is used here because wear is greater on grooving than on chamfering tools, it can be quickly re-ground, and a special throw-away insert for this use could not be indexed and would be too costly.



Because
"SEEING IS BELIEVING"
let this film show you how

THE
PRATT & WHITNEY
Electrolimit
JIG BORER



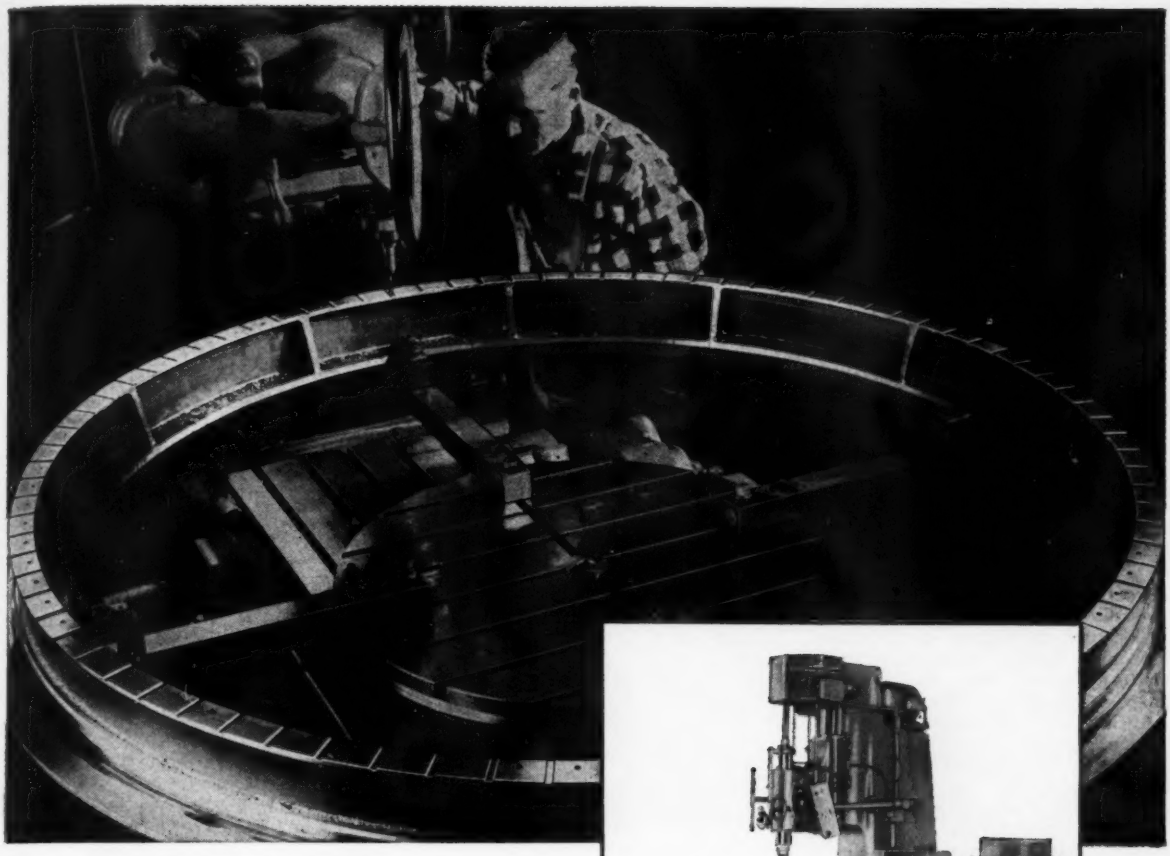
- INCREASES ACCURACY
- HELPS ELIMINATE COSTLY ERRORS
- IMPROVES WORK QUALITY

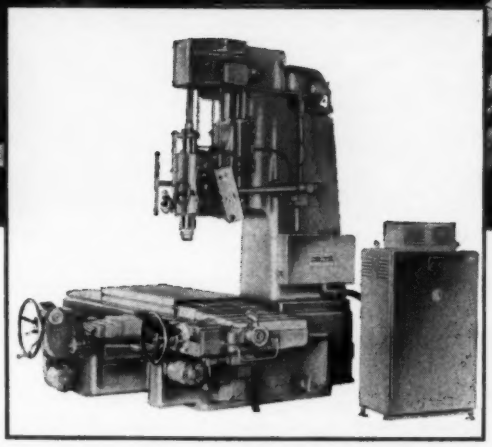
And
- REDUCES PRODUCTION COSTS IN THE TOOLROOM *AND ON THE PRODUCTION LINE!*

Arrange Now . . .
for a showing of the new 16 mm sound motion picture film in full color.
"ACCENT ON ACCURACY"

Write on your company letterhead to Pratt & Whitney Company, Inc., 15 Charter Oak Blvd., West Hartford 1, Conn.

PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS





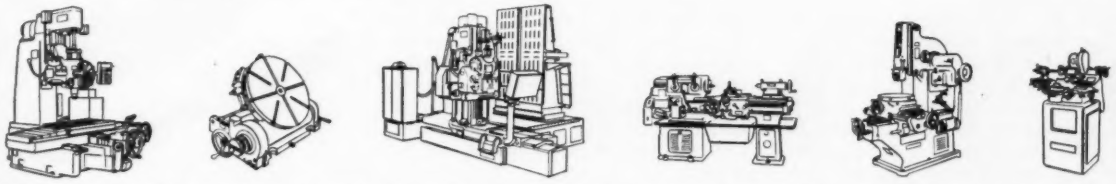
PRECISION plus BIG CAPACITY

P&W JIG BORERS WITH OPEN-SIDE CONSTRUCTION

Nearly 6 feet in diameter, the aircraft tooling fixture shown above was really big! It required machining 84 slots and boring 84 holes on the face and machining 84 slots on the flange. *All* 252 slots and holes had to be equally spaced and located within ± .001" of true radial. Handling jobs like this with ease and efficiency takes the combination of high precision and big work capacity you'll find only in a Pratt & Whitney Jig Borer with Open-Side Construction.

Pratt & Whitney Jig Borers – both Electrolimit and End-Measure types – are produced in complete lines for every work size requirement. All types and models will locate accurate to .0001" . . . and will retain this initial high precision and rigidity *indefinitely!* Get complete information now.

Write for your copy of Circular No. 587. Pratt & Whitney Company, Incorporated, 15 Charter Oak Boulevard, West Hartford 1, Connecticut



JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 109

ADAPTERS FACILITATE TORQUE WRENCH USE IN HARD-TO-REACH SPOTS

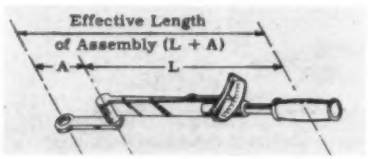
Many plant applications for torque wrenches involve gaining access to places where even conventional sockets, open end wrenches, box, flare-nut, and spanner tools cannot be used. It is not uncommon to see an irregular shaped tool that has been made to special order to facilitate more rapid assembly work.

On applications requiring special tools it is often desirable to control torque. What often seems to be an impossible torque application can be accomplished many times with a correctly designed adapter.

Frequently, a torque wrench with an adapter can be made to work as conveniently as the special tool that has proven successful in gaining access to the application. In many instances it is only a matter of adapting the present special tool to the torque wrench.

There are only two important rules to remember when using adapters. One is that the torque wrench must have some form of concentrated hand loading position, such as a pivoted handle. The other is that an adapter will increase the capacity of any torque wrench.

An easy rule to remember when using adapters is that the adapter will increase the capacity of a torque wrench in proportion to the lever length of the adapter to the lever length of the torque wrench. An adapter equal to the lever length of



the torque wrench lever length will enable the maximum scale reading to be doubled. For example, if an adapter were 15", center to center, and the torque wrench 15", center to center of the concentrated load position, the reading of the torque scale would be doubled.

From this example, it is easy to see that a simple adapter, which can even be made from a regular socket handle, would permit making two torque wrenches out of one. It permits purchasing the less expensive and more versatile of two possible choices of torque wrenches, and the one that will be the fastest and easiest to use on the job.

The solution of a typical problem will more clearly demonstrate the method of determining the correct lever length of an adapter when the other factors are known.

For example — a manufacturer had an assembly job to perform which required that an adapter be used with his torque wrench to reach the nut fasteners. The specifications called for a torque of 1500 in-lbs to be applied to the nuts. He therefore had to determine the lever length of the adapter to be used. This lever length is represented by "A" as shown on the line drawing.

He knew that the standard length "L" of his torque wrench was 12". He also knew that his workman was capable of pulling a force of 75 lbs on the handle of the torque wrench.

Therefore 75 x 12 = 900 in-lbs, the wrench scale reading required to apply 1500 in-lbs at the end of the adapter.

Substituting these known values in the standard formula:

$$A = \frac{(T_a - T_w) \times L}{T_w}$$

Where:

A = Length of adapter.
T_a = Torque exerted at the end of the adapter.
T_w = Wrench scale reading.
L = Lever length of torque wrench.

We have:

A = ?
T_a = 1500 in-lbs
T_w = 900 in-lbs
L = 12"

Thus:

$$A = \frac{(1500 - 900)}{900} \times 12$$

$$A = \frac{600 \times 12}{900} = \frac{7200}{900}$$

$$A = 8"$$

This simple formula should be kept on hand to determine the proper selection of the size or lever length of an adapter and a suitable torque wrench.

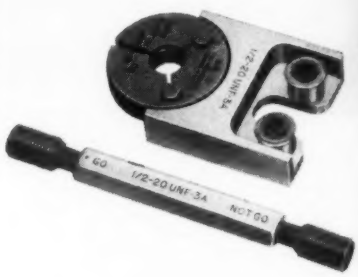
Because an adapter will increase the capacity of a torque wrench, for production application it is sometimes desirable to have the torque wrench furnished with a special scale. This compensates for the added capacity of the torque wrench and enables direct reading of the scale.

When the adapter rule is understood, the fullest advantage of the torque wrench is gained and application time is speeded up and the investment in tools is reduced. With an adapter, you can make two torque wrenches out of one. A variety of adapter types are products of P. A. Sturtevant Co.

. . . AND FOR YOUR THREAD-INSPECTION JOBS BEST HANDLED BY P&W CONVENTIONAL GAGES . . .

"GO" and "NOT GO" RING GAGES

provide a functional check at maximum metal limit and a pitch diameter check at minimum metal limit.

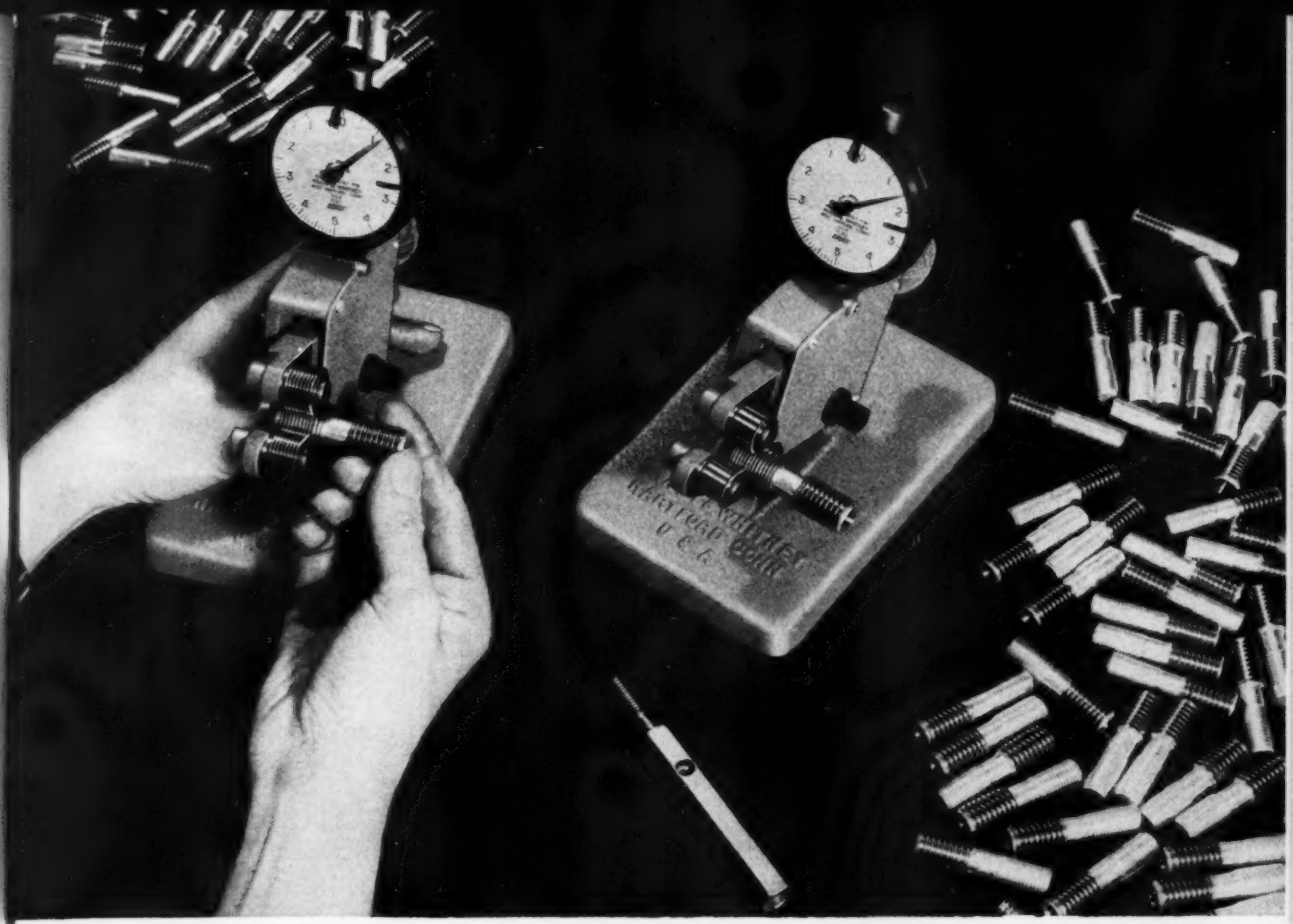


RING-SNAP LIMIT THREAD GAGES

provide a functional check with a "Go" ring at maximum metal limit and an actual pitch diameter check at minimum metal limit with single-rib radius rolls of best wire size.

ROLL THREAD SNAP GAGES

provide a functional check with multiple-rib "Go" rolls at maximum metal limit and a pitch diameter check at minimum metal limit with 2-rib "Not Go" rolls.



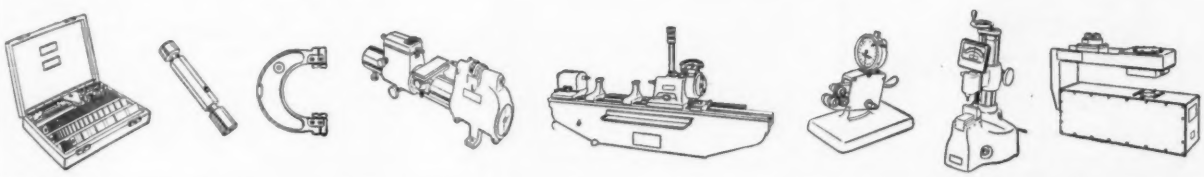
CHECK CLASS 3 and 3A THREADS *on a Production Basis*

. . . QUICKLY, DEPENDABLY AND ACCURATELY WITH A P&W TRI-ROLL THREAD COMPARATOR

Here for the first time is a *production gage* that duplicates the precise 3-wire thread measurement method. Equipped with single-rib rolls, the P&W Tri-Roll Thread Comparator provides this *critical check at actual pitch diameter* which is essential in producing threads to meet Class 3 and 3A standards. Equipped with interchangeable full-length rolls, it also provides a *complete functional check* . . . detecting "drunken lead" and deviations in lead, roundness, angle, and pitch diameter.

Today, a greater demand is placed on you for higher precision. A fast-growing percentage of threads must now be produced to meet Class 3 and 3A standards. Be sure your quality control methods are geared to keep pace with this growing demand . . . efficiently and profitably. Write now for complete information on P&W Tri-Roll Thread Comparators.

Pratt & Whitney Company, Incorporated,
15 Charter Oak Boulevard, West Hartford, Conn.



GAGE BLOCKS . . . CONVENTIONAL GAGES . . . SUPERMICROMETERS . . . STANDARD MEASURING MACHINES . . . COMPARATORS . . . AUTOMATION AND CONTINUOUS GAGES

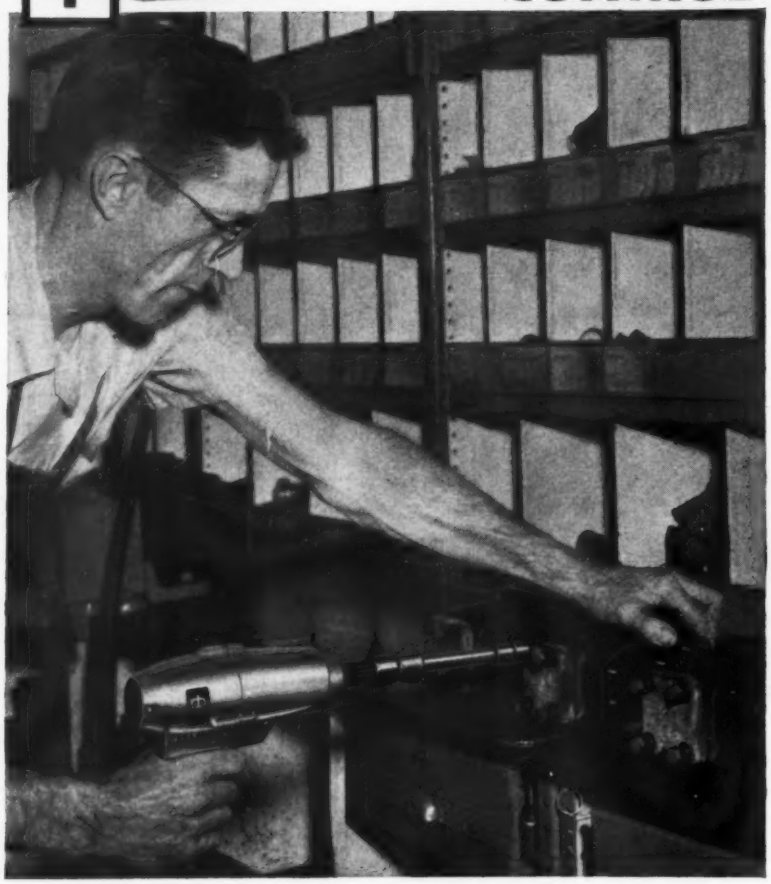
PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 111

IR TORSION BAR TORQUE CONTROL



TORQUE CONTROL IMPACTOOLS meet torque specifications 100%

Quality Control Improved on 12 Jobs in 3 Departments

1. **Cable control assemblies:** 5 operations involving torques from 14 to 75 ft. lbs.
2. **Scraper Assembly:** 6 line jobs using Impactools set for 40, 60, 75 and 80 ft. lbs. torques.
3. **Hydraulic control assembly:** 1 job running ½" cap screws to 65 ft. lbs. torque.

Production checks made by this manufacturer of road building equipment show that new Ingersoll-Rand Torsion-Bar Torque Control Impactools run every nut and cap screw within torque specifications.

With the standard impact wrenches previously used, the operators attempted to control torque by length of time the tool impacted. The new Torque Control Impactools shut off instantly and automatically when the pre-set torque is reached. This simplifies operator training and improves worker morale.

The end result is dependable product performance in the field. This same kind of cost-saving performance can be put to work for your company now. Write for Bulletin 5170.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

8-525

CIRCLE INFORM-A-GRAM KEY NO. 112

BONDING COMPONENTS TOGETHER PERMANENTLY

Automatic, rotary-cycle, bonding machines have been developed that feature positive control of all primary bonding factors.

The machines, built by Modern Industrial Engineering Company, range from single and multi-station stationary types up to 40-station rotary types for permanently bonding (using a commercial adhesive) liners to either internal or external surfaces.

The machines are basically designed to offer complete control of all variables of the bonding process. Production flexibility is provided through independently operated banks of stations.

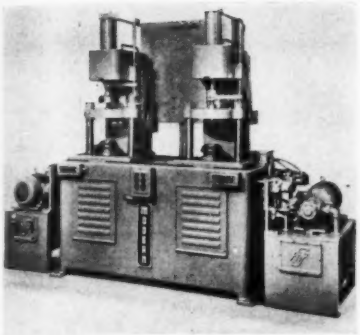
This 20-station rotary bonding machine completes a bonded part at each station in 6 min for a production rate of 200/hr.

In one particularly difficult automotive application (bonding a cone-shaped liner to a conical surface while maintaining proper lateral plane of the liner in relation to the metallic cone) Modern engineers achieved a production rate of 200 units/hr using the 20-station bonding machine.

In this operation, parts are manually loaded and unloaded at one station of the machine; all other operations are automatic. When the liner and band assembly are placed in one of the special locating fixtures, a peripheral stationary cam under the guard rail actuates an air valve that controls a double-acting air cylinder. This brings the fixture into the clamping position at a pressure of 200 psi at the bonding line. A pressure-control valve at each station is variable to provide the exact pressure required.

Companion to the line of bonding machines is a special cold-assembling press also developed by Modern. When used in connection with the bonding operation previously discussed, the 2-station cold-assembling press locates, positions and pre-bonds the cone-shaped molded liner to the conical surface of a piston.

The press operator places the pis-



This special press locates, positions and prejoins parts prior to bonding. Manually loaded and unloaded, and using an automatic work cycle, the press turns out about 200 joined parts/hr.

ton and pre-treated (using oven-dried cement and a solvent activator) liner on the lower platen of one station and finger positions them together. Both parts are held by a retaining collar.

The automatic cycle then takes over with the press ram being lowered against an expandable neoprene mandrel to axially produce pressure about the entire liner area. This action provides positive location and avoids any danger of securing the liner in elliptoid position.

A holding pressure of about 400 psi is then applied by the ram and maintained for a predetermined and variably controlled cycle. Ram return is automatic. The operator loads one station while the other station is in automatic or manual operation.

—— • ——

Coming Events

July 5-7. Maine Apprenticeship Council and U.S. Department of Labor Bureau of Apprenticeship and Training. Annual Eastern Seaboard Apprenticeship Conference. Marshall House, York Harbor, Me.

•

July 24-27. National Tool & Die Manufacturers Association. Summer Board Meeting. Grove Park Hotel, Asheville, N. C.

•

July 29-Aug. 2. National Machine Tool Builders' Association and American Machine Tool Distributors' Association. Annual Sales Conference. Cornell University, Ithaca, N. Y.

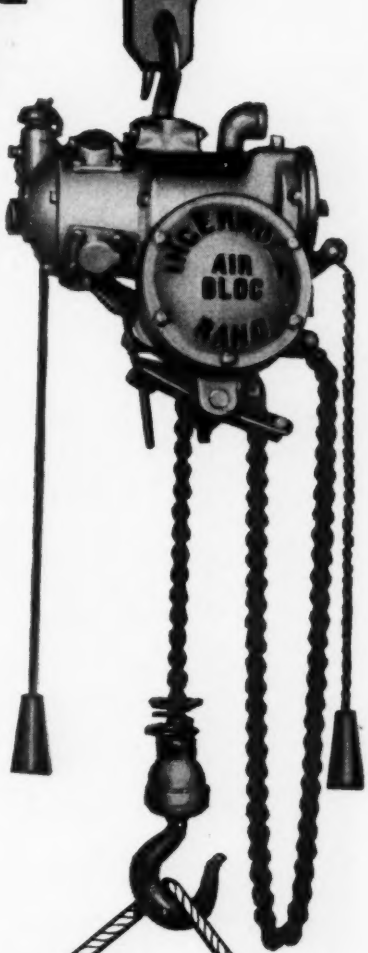
•

Aug. 7-9. Metallurgy Division, Denver Research Institute, University of Denver. Annual Conference on Industrial Applications of X-Ray Analysis. Albany Hotel, Denver, Colo.

small, lightweight air hoist gives you greater VERSATILITY

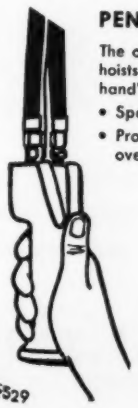
Ingersoll-Rand

AIR-BLOC combines safety, ruggedness and mobility...



Move it anywhere . . . hang it anywhere . . . the I-R AIR-BLOC gives you versatility you never thought possible for speedy handling of loads up to 1000 pounds. No mechanical brake to fail . . . load can't drop even if air pressure fails. Responsive throttle control and automatic up-down-stop permit extremely accurate handling. There's a size just right for your job.

Portable winch-type Utility Hoists, in a wide range of sizes up to 4000 lbs., are also available from Ingersoll-Rand.



PENDENT THROTTLE

The only complete line of air hoists with convenient "one-hand" control.

- Speeds spotting of loads.
- Provides "Finger-tip" control over full range of speeds.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.

AIR HOISTS up to 24,000 lbs.

CIRCLE INFORM-A-GRAM KEY NO. 113

diamond-like quality and hardness!

ACME

DELUXE MODEL SOLID TUNGSTEN CARBIDE DRILL JIG BUSHING

- Wears 50 times longer
- Made to A.S.A. standard tolerances or special requirements
- Made in all types of A.S.A. standards
- Manufactured with full drill bearing surface
- Reduces down time to an absolute minimum
- Non-corrosive and rust-resistant
- Many sizes in stock

Write your distributor or Acme for information and prices on tungsten carbide, micro and standard drill jig bushings.

ACME INDUSTRIAL COMPANY
206 N. Laflin Street • Chicago 7, Illinois • MOnroe 6-4122

CIRCLE INFORM-A-GRAM KEY NO. 114

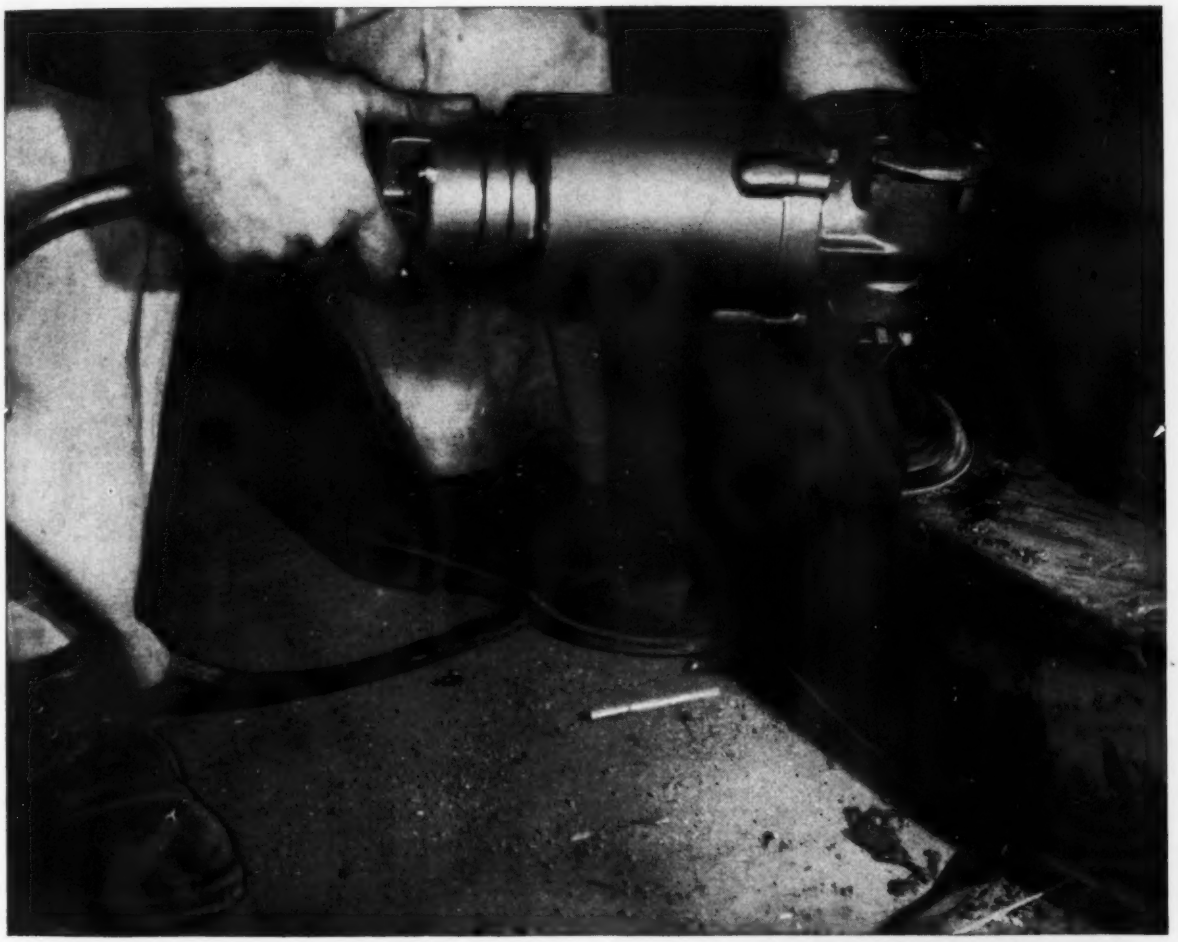
Cuts job time 50%

WITH ROTOR 180-CYCLE ELECTRIC GRINDERS

JOB: Grinding weldments of mild steel and stainless steel. With universal electric grinder, took 60 minutes; downtime for maintenance was high. Switched to Rotor 882 VG—180-cycle Right Angle Grinder.

RESULTS: Cuts job time to 30 minutes. Savings pay for new grinders in eleven weeks. Wheels and discs last longer. Downtime for maintenance slashed.

You can be sure of getting the *right tool*... air or high-cycle electric . . . when you call in the Rotor Application Engineer. Write for Bulletin 51 on the Rotor 180-cycle tools or Bulletin 48 on Rotor 360-cycle tools. The ROTOR TOOL Company, Cleveland 32, Ohio.



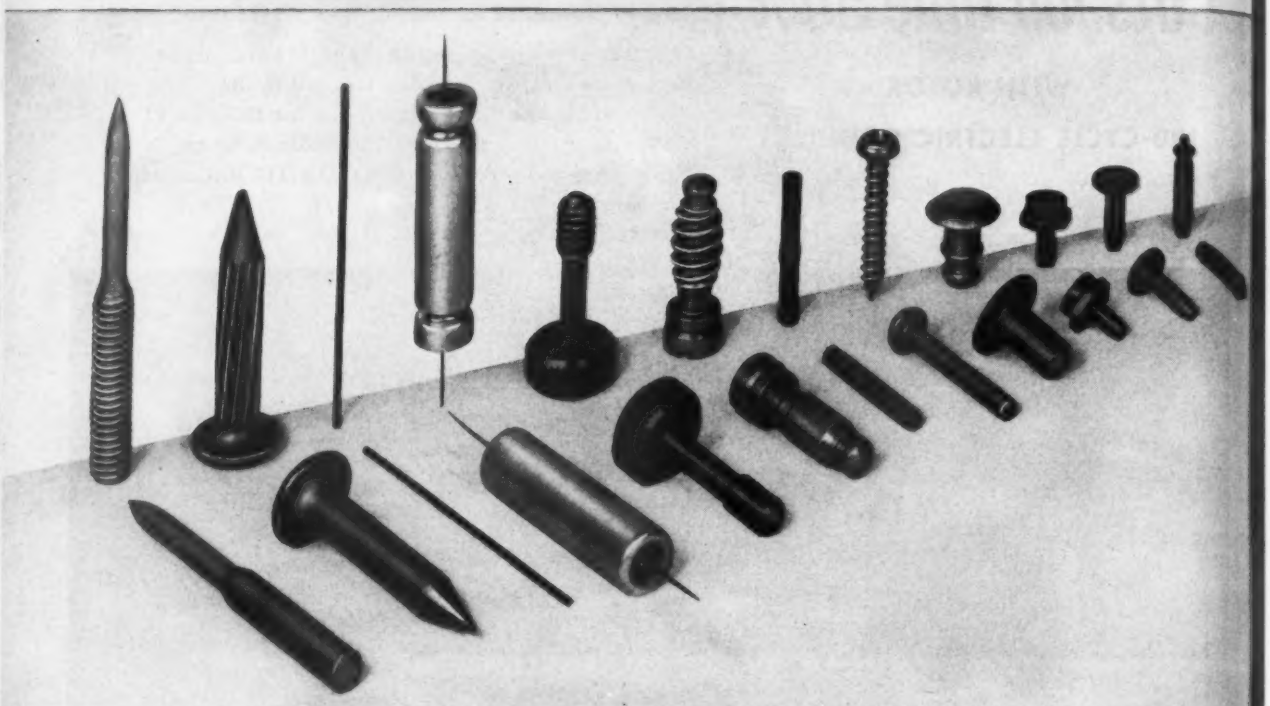
Here's the RIGHT TOOL for YOUR job!

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

ROTOR TOOLS
CLEVELAND, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 115

HARTFORD SPECIAL AUTOMATIC MACHINES COLD FORM 15,000 SMALL PARTS PER HOUR



MODEL A-190-R WITH ROTARY HOPPER

MANUAL MODEL A-312-M

Profitable short runs possible because of low initial cost, inexpensive dies and reduced setup time from job to job.

Accuracy of parts maintained through the life of the dies because of simplicity of design, rugged construction and vibration-free operation.

Hopper fed operation requires only an attendant to load and unload.

Compact size requires less than 4 x 6 feet of floor space.

No special installation or electrical service required. Motors equipped with starting switch and automatic cutout for overload safety.

Handles ferrous and non-ferrous parts including brass, copper, magnesium, molybdenum, titanium, zirconium, powdered metals, aluminum, stainless steel, vitalium, plus bakelite and fibre.

Hartford also makes automatic Drilling and Tapping Machines, Machine Components, Special Machines and the world famous Super-Spacer.

HARTFORD *Special*

THE HARTFORD SPECIAL MACHINERY CO. • MACHINE TOOL ACCESSORIES DIVISION • 2927 HOMESTEAD AVE., HARTFORD 12, CONN.

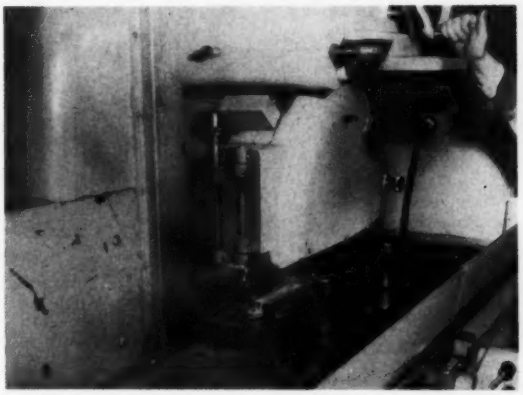
Less Die Downtime, Lower Toolroom Costs With New Surface Grinder

RECENT INSTALLATION OF a high-powered precision surface grinder in the Teletype Corporation's Wrightwood plant in Chicago is already paying dividends in toolroom operations.

The toolroom there services tools used by the various departments. A big job for the new grinder is the handling of stamping dies. Previously, many of the larger dies had to be dismantled prior to being ground in sections on small grinders. The new Mattison grinder can handle any die used in the plant, so it is no longer necessary to send larger dies to outside sources for grinding. This avoids both the costs and inconvenience commonly encountered in the past.

Not only is the saving in toolroom, man-, and machine-hours significant since the addition of the new grinder, but the dies can be put back into production much faster than in the past. On emergency or rush jobs, according to Teletype, this factor alone makes the investment worthwhile.

Another job on which the grinder demonstrated its productivity was in the grinding of 50 small vise jaws. All 50 pieces were ground in one load and total machine time was 20 min. Previously, only eight vise jaws could be handled per load, and it also took 20 min/load. The reduction in total machine time alone amounted to 83% when the large grinder was used.

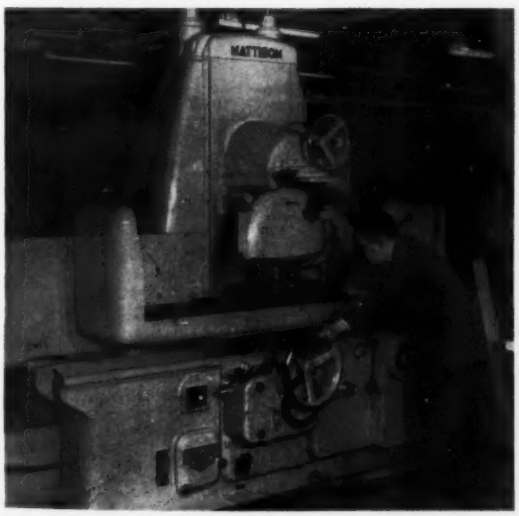


In action, a close-up shows a perforating die being ground.

Equally important to both supervisory personnel and grinder operators is the simplicity of operation and positive control designed into the new machine. Operational safeguards like the spindle lubrication pump start button which makes it impossible to run with a dry spindle bearing, and the "one-shot" lubrication system, are design features especially noticed by Teletype management.

end

Starting a run on the Mattison grinder installed at Teletype's Wrightwood plant.



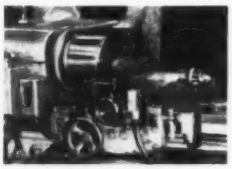
This front plate of this perforating die formerly had to be disassembled and ground in six sections. It is now a one-piece operation.

"The Sky's The Limit" when it comes to profitable uses for MAGNA-LOCK CHUCKS

Your investment in a Magna-Lock electro-magnetic chuck is an investment in *versatility* which pays real dividends many times over. In addition to normal surface grinding operations, users are constantly finding new and practical applications of the *extra holding* power of Magna-Lock Chucks for jobs such as these:

MILLING OPERATION

66% reduction in setup time for milling cast iron gibs at Turchan Follower Machine Co.



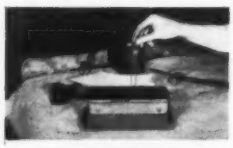
LATHE OPERATION

Holding 1/8" thick steel discs for grooving. Production, 300 pieces per hour. Wabash Div., Raybestos Manhattan Co.

TRANSFERRING PARTS

loading and unloading water heater shells at Permaglas Div., A. O. Smith Corp.

FLAME HARDENING



LAYOUT WORK

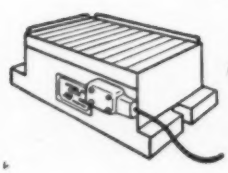
HAND FILING

Your jobs, too, can be done faster, at less cost through the *22% extra holding power* of Magna-Lock Chucks—all steel, moisture-proof, shock-proof. Rectangular chucks from 5" x 10" to 30" x 96" working surfaces—rotary chucks from 6¼" diameter face to 72" diameter—swiveling chucks from 5" x 10" to 12" x 84".

To get the most for your money, specify Magna-Lock. To make the most of Magna-Lock versatility, consult our engineers about your idea or problem. We'll be happy to work with you.

WRITE DEPT. TP-77

Request Magna-Lock as *original* equipment on your new machines.



Hanchett **MAGNA-LOCK CORPORATION**

BIG RAPIDS, MICHIGAN, U. S. A.

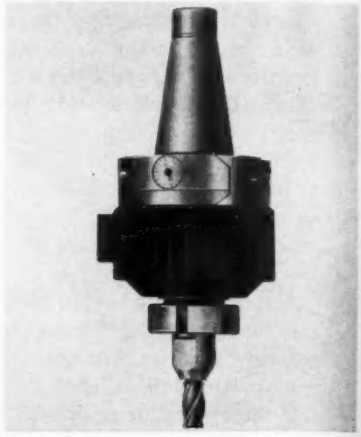
designers and makers of a complete line of magnetic chucks and devices.

CIRCLE INFORM-A-GRAM KEY NO. 118

NEW DRIVER INSURES FASTER END MILL CUTTING

Faster production is possible using the new P.D.Q. end mill driver. This tool partially eliminates the need for special diameter sizes.

A provision for offset positioning produces an orbital motion of the cutting tool, which permits one-pass cutting of keyways with under-size end mills. This orbital motion also increases chip clearance, insures square slots, and permits milling true-to-centerline on keyways.



The end mill driver has a 4:1 speed ratio between the spindle and the cutter, which enables it to do work while the machine loafs. With this feature, old machines have increased speed advantages and newer ones last longer by running at lower rpms.

The P.D.Q. end mill driver will accommodate end mill shank sizes from ⅜" to 1". Eccentric micrometer positioning ranges from 0" to 0.062" off center.

For further information on the end mill driver, contact Portage Double-Quick, Inc., 1046 Sweitzer Ave., Akron 11, O., or —

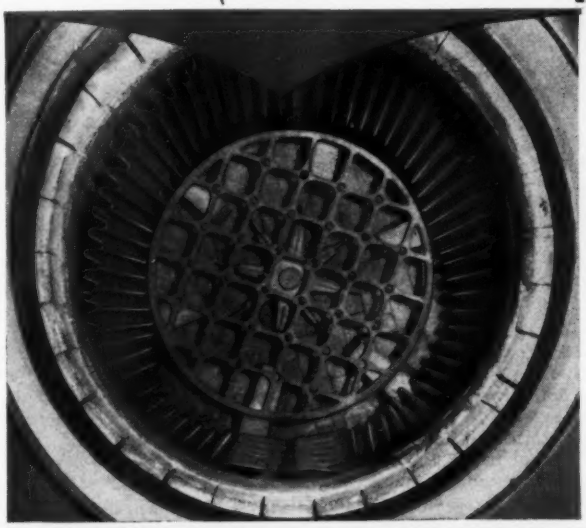
Circle Inform-A-Gram No. D1.

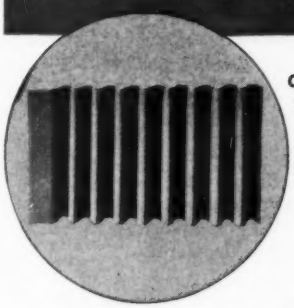
A new lapping process, which assures a perfectly flat, smooth finish on Besly Toss-Away carbide inserts has been announced by Besly-Welles Corp. With this process, two carbide inserts easily wring together. This feature gives the inserts greater cutting tool life per cutting edge with less chipping and breakage.

FROM THE OUTSIDE

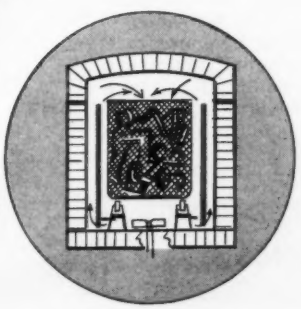
. . . JUST ANOTHER LINDBERG PIT-TYPE CARBURIZING FURNACE

BUT LOOK INSIDE





CORRTHERM elements operate on extremely low voltage. No leakage through carbon saturation. Shock or short hazards eliminated. No complicated mountings required. An exclusive Lindberg development.



Note how CORRTHERM elements serve as baffles to direct forced convection streams through the charge.

No Retort!

Because it needs no retort, this new Lindberg electric vertical pit-type furnace gives you these important advantages:

- **Lower initial cost, no retort to pay for.**
- **No expensive retort replacement.**
- **Downtime for retort replacement eliminated.**
- **Increased production because it heats faster.**
- **Exact atmosphere control maintains work quality.**
- **Versatile, carbon-diffusing and requenching along with carburizing. Adaptable to variety of work.**

All this is made possible by Lindberg's new CORRTHERM electric heating element. For lower initial cost, lower maintenance costs, faster production, better quality control, why not look into this furnace. It's additional evidence that, if you're concerned with the application of heat to industry, better talk it over with Lindberg.

LINDBERG
ENGINEERING COMPANY

2445 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 S. Regentview Ave., at Downey, Calif.
Toronto Plant: EFCO-Lindberg, Ltd., 11 Front Street, East

CIRCLE INFORM-A-GRAM KEY NO. 119

They're tough, they're versatile

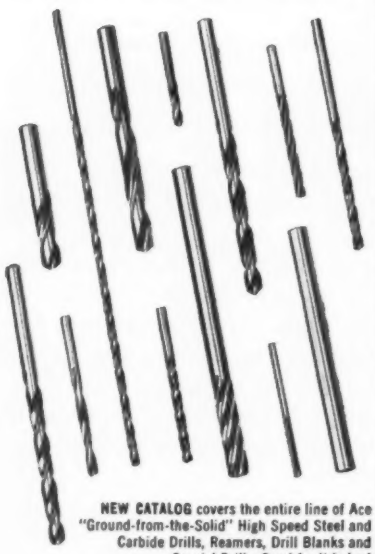
. . . and amazingly low in cost!

ACE

STUB DRILLS

The short, heavy duty flutes of Ace Stub Drills are ground into top quality pre-hardened high speed steel to give you keener cutting lips, extra strength, longer drill life. Ideal for close-to-work screw machine operations and portable drilling. And they're now stocked in 140 standard sizes that cost approximately 20% less than equivalent jobber length drills!

Call your local Ace Drill Distributor today!



NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL
ADRIAN, MICHIGAN

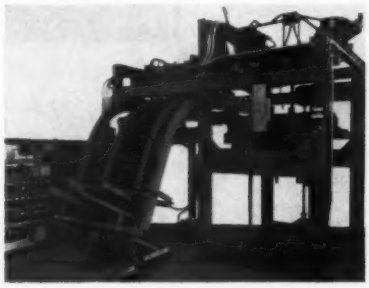
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1201

TUBE AND BAR STACKER AUGMENTS CUTOFF MACHINE PRODUCTION

A new, automatic stacker has been designed to handle either tubes or bars, from a cut-off machine, and stack them in a storage rack, ready for delivery to the assembly line.

The "Spurgeon Automatic Stacker," developed by the Spurgeon Co., has the 2 angle slides at the front of the machine. As the tube (or bar) is released by the cut-off machine, these angle slides direct the tube to the bottom of the slide. Next, a pair of steel blades lifts the tube up above a pair of dogs, into the curved section of the machine — pushing the previously handled tubes up the inclined section, to form a magazine fill. Then the entire layer of tubes is pushed up the curved section, to the top of the machine.



At this point, the mechanical drive assembly takes over to synchronize the action of the overhead transfer carriage and the lift table.

The entire layer of tubes, at the top of the machine, is lifted by a grab; transferred horizontally until correctly positioned over the storage rack, located on the lift table; and then, the entire layer of tubes is deposited on the rack, evenly and straight.

The overhead carriage then returns to its original position to await new magazine fill. Meanwhile, the lift table is lowered a distance equivalent to one layer of tubes. When the magazine is filled again, this automatic handling is repeated.

The lowering movement of the lift table continues, after each layer of tubes is deposited, until the storage rack is filled. When full, the rack is automatically pushed from the lift table, and an empty rack is automatically placed on the lift table.

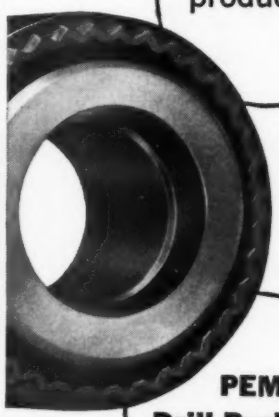
The lift table, with the empty rack in place, returns to the uppermost starting position, automatically by a fast-lift action — and, then the cycle repeats itself.

BUY U. S. SAVINGS BONDS

revolutionize

template

production



PEM Drill Bushings will show you how!

Simple, fast, assembly cost-cutting.

One-hole compression-mounting, self-clinching, in one operation. No riveting. No welding. No outboard supports.

High torque and pull-out resistance.

Alignment and center distances secured, automatically.

Round—No indexing or "nesting".

Permit thin-gauge, light weight templates.

Pay for themselves out of template production savings.

Write for literature and samples. Penn Engineering & Manufacturing Corp., Doylestown, Pa.

PEM

CIRCLE INFORM-A-GRAM KEY NO. 1202

Assemble "A" GRADE WORKING GAGES with DoALL Shop-Blocks and MICRO-STEP

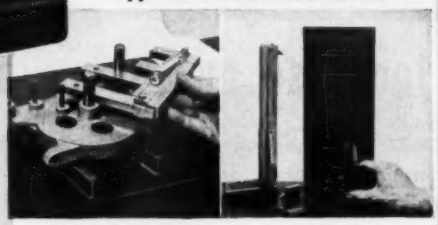
only $265.00 for 84 piece set
only $130.00 for 36 piece set

NEW SHOP-BLOCKS

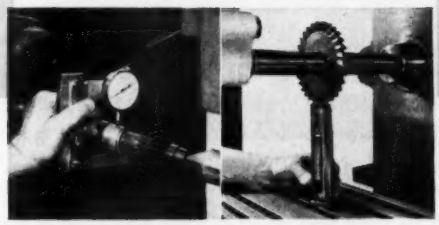
GUARANTEED
"A" grade accuracy at less than "B" grade prices!

ACCURACY: + .000006" — .000002"
FINISH: 0.8 AA or better
FLATNESS: .000004"
PARALLELISM: .000004"
HARDNESS: 65 Rockwell C

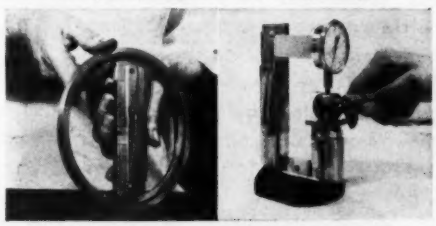
Typical GAGE ASSEMBLIES



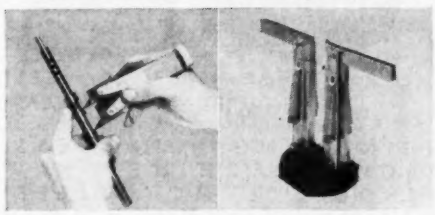
Go—no go gage | Scribers



Indicating Snap Gage | Height Gage



Ball End Pin Gage | Indicating Comparators



Special Caliper Gage | Go—No go Height Gage

MAKE 1000's of SHOP GAGES with Micro-Step Gaging System

Here is an unbeatable combination for improving dimensional control in your shop...reducing rejects...eliminating waste...and, you reduce your gage costs:

1. New Low-Priced DoALL Shop-Blocks — the only A Grade "working" gage blocks available today. Here is the accuracy you need to control modern tolerances of .001" and finer. DoALL has completely discontinued manufacture of B Grade gage blocks, as totally inadequate for today's needs. Now you get A Grade blocks at less than B Grade prices. Compare them and see.

2. DoALL Micro-Step Gaging System — unique and versatile accessories enable you to quickly assemble thousands of different gage block gages for shop use. The Micro-Step System eliminates the need for many special gages, gives you superior accuracy and enables you to use your gage blocks constantly with practically no wear.

Your local DoALL Store can tell you more about how you can cut costs and improve production with new DoALL Grade A SHOP-BLOCKS . . . and the Micro-Step System. Call DoALL today or write.

Find The DoALL Store in The 'Yellow Pages'

ASK FOR LITERATURE

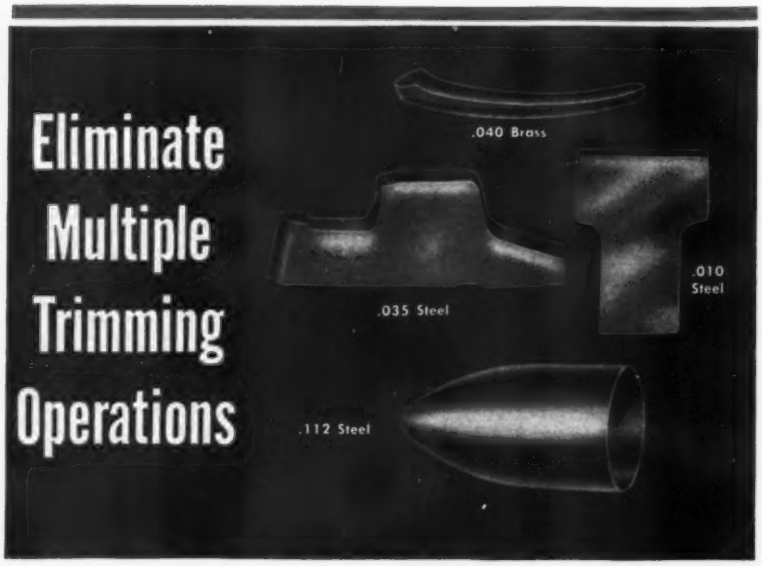
The DoALL Company
Des Plaines, Illinois

THIS IS A TYPICAL DoALL STORE

Call Your DoALL Service-Store

Machines and Blades | Surface Grinders | Power Saws | MACHINE TOOLS ..... CUTTING TOOLS ..... MEASURING INSTRUMENTS ..... SHOP SUPPLIES IN STOCK

CIRCLE INFORM-A-GRAM KEY NO. 121



Increase output . . . reduce costs!

Costly, time-consuming trimming and notching operations can be done in one operation with a Brehm Trimming Die. Don't worry about stock thickness. Edges will be of full thickness — clean, flat, without burrs or distortion at the trimmed edge.

Other Brehm Die advantages! **Workable Materials** — gold, silver, stainless or mild steel, copper, brass, refrigerator doors, auto bumperbuf zinc, aluminum, fiber, rubber, plastics, **Quantities vary** — Stove or refrigerator doors, auto bumper buffers or typewriter covers, from 264 to 900 per hour. Intermediate parts, where stock and scrap can be blown from the die, about 1200 per hour. **Shapes** — fountain-pen ferrules, artillery cases, watch cases, burial valuts, automotive, kitchen, radio and television accessories and parts. Almost anything you need trimmed.

A Brehm "Shimmy" Trimming Die with angular cams, cuts four ways in one press stroke, handling straight or curved edge contours, with multiple notches and projections. Slow, costly "horn" and "pinch" trimming operations, are eliminated.

Submit part prints for our quotation on shells to be trimmed, or blanked, formed or pierced also.

THE SHIMMY REG. DIE

Brehm® TRIMMING DIES

41ST YEAR OF VULCAN SERVICE

ENGINEERING • PROCESSING • BUILDING
SPECIAL MACHINES • VULCANAIRE JIG
GRINDERS • MOTORIZED ROTARY TABLES
BREHM SHIMMY AND RELATED DIES

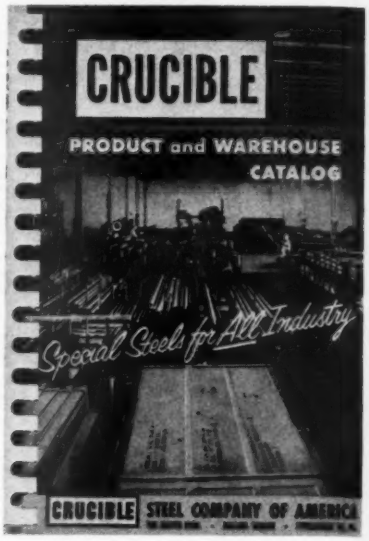
VULCAN TOOL CO. (YOUR TOOL ROOM IN DAYTON)
BREHM DIE DIVISION • 731 LORAIN AVENUE • DAYTON 10, OHIO

VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 122

OVER 700 PRODUCTS LISTED IN CATALOG

Designed for purchasing agents and steel users is a 232-page Product & Warehouse Catalog. It describes over 700 products available from stock at warehouses of Crucible Steel Co., located throughout the country.



The index lists 16 categories of special purpose steels, including high speed, tool, stainless, alloy, and machinery, produced in 16,000 grades and sizes. Over 20 estimating, conversions, and weight tables are also contained in the catalog.

Copies of the Product & Warehouse Catalog can be obtained by writing to Crucible Steel Co. of America, Engineering Service Dept., Box 1558, Pittsburgh 30.

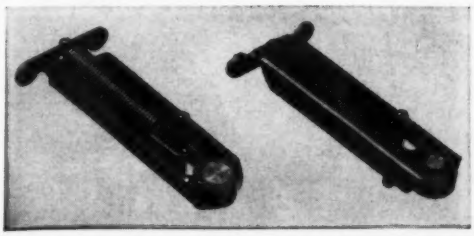
AUTOMATIC MACHINE ASSEMBLES AND INSPECTS 720 PARTS PER HOUR

A new 8-station automatic assembly machine, designed to automatically perform multiple assembly operations, also performs pressfit inspection on automatic transmission gear carrier assemblies.

Four pinions with needle bearings and spacers for each are previously assembled into the gear carrier and held in place with dummy pins. These assemblies are manually loaded into the machine. At the 1st station permanent pins are fed from two vibratory hoppers, shuttled into position, and pressed into the assembly, forcing out the dummy pins.

. . . *Continued on Page 131*

FOR POSITIVE STOCK ALIGNMENT
IN PROGRESSIVE DIES



Amcor Roller Stock Pushers

SPEED UP PRODUCTION with precision-made AMCOR Roller Stock Pushers. Easy, smooth stock feeding, without buckling, assures more production with less operator fatigue.

SAVE MONEY. AMCOR Roller Stock Pushers sell for just a fraction of what hand-made bench models cost to make.

SIMPLE TO INSTALL. Requires only a slot milled in the stripper plate, and a hole drilled in the die block and stripper plate. Tracing template for slot and hole location is supplied. When die is sharpened, no refitting is necessary.

The AMCOR Roller Stock Pusher is quickly adaptable to any work specifications. Distributors throughout the country stock a complete line of nine models to fit all production needs.

Write us for complete information

APPLIED MECHANICS CORPORATION
P.O. BOX A882 GRAND RAPIDS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1231

MAXWELL
AUTOMATIC RECESSING TOOLS
REDUCE INTERNAL FORMING COSTS

These fully automatic, quickly adjustable tools save time, and cut costs on precision grooving, undercutting, inaccessible spot facing, chamfering, back facing and necking!

Maxwell Type JF Automatic Recessing Tools operate on the principle of an eccentric cutter holder actuated on its own axis. This is accomplished by the unique Maxwell Helical Gear and Diagonal Toothed Rack Mechanism.

They are used with jig or fixture on automatic or manual feed machines. Long-life circular form cutters, or tool bit holders with tool bits may be used. Location and diameter of recess are individually controlled by stop collars, adjustable to within ±0.001-inch. Five sizes available to pilot into 1" to 2¼" bushings. Furnished with shank to suit.

392R-MC *WRITE TODAY FOR BULLETIN NO. JF*

THE MAXWELL COMPANY
Macedonia, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1232

If You want to PRODUCE MORE
. . . develop Your PARTS FEEDING with VFC

BASIC EQUIPMENT
MOTIVATION . . . . . AUTOMATION

VFC HAS A CHARTED COURSE THAT WILL HELP YOU!

The real impelling force at VFC, aside from developing better parts feeding equipment, is how to help industry produce more.

When one or more parts are scheduled for a rendezvous, you need parts feeders and VFC's technical knowledge of how they can be adapted to your product or production line. No matter what direction your business takes, use VFC's parts feeding know-how as the motivation to automation.

TECHNIQUES FOR . . .
SIZES • SHAPES • MATERIALS

This tremendous storehouse of parts feeding information is available to you—make use of it and produce more—automatically. If you have a parts feeding job pending, the chances are the answer is in your VFC Sales Engineers Data Book, ask about it.

VIBRATORY FEEDER COMPANY
32nd and BRANDES STS., ERIE, PA. • PH 4-6320
Division of Automation Devices, Inc.

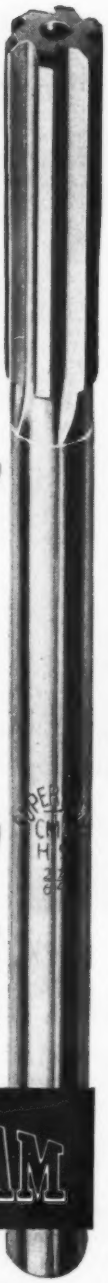
CIRCLE INFORM-A-GRAM KEY NO. 1233

What other tool companies consider "SPECIALS"

(IN DECIMAL SIZES)

...WE STOCK AS STANDARD

Thousands of chucking and Stub Reamers by the .001 in Stock ready for the precise job. Why buy or make "SPECIALS" when you can BUY from STOCK — over night.



SUPEREAM

IN EMERGENCY
Telephone
Libertyville 2-4200

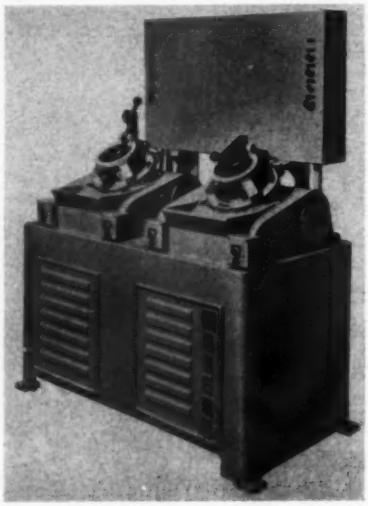
TWENTIETH CENTURY MANUFACTURING COMPANY
BOX 429-TP
LIBERTYVILLE, ILL.

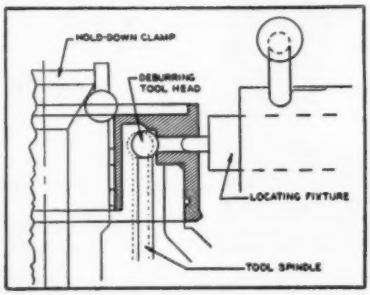
CIRCLE INFORM-A-GRAM KEY NO. 1241

TWO-STATION MACHINE CHAMFERS HIDDEN HOLES

A two-station Burr-Master machine has been developed for the functional chamfering of hidden holes. Workholding fixtures are of necessity custom-tailored, but the machining concept itself is applicable to many similar automotive and aircraft parts.

As set up for an automotive-parts producer, the new machine countersinks 20 blind holes on an internal diameter of a stator-blade piston for an automatic transmission. Functional chamfering was necessary to

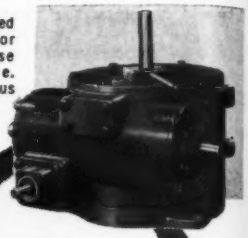




permit clearance for operation of a gate-like mechanical valve in each hole. Parts are semi-automatically positioned on the work spindle and wedged, then manually clamped. Central and radial locations of the workpiece is taken from pre-drilled holes. The rotary tool, mounted on a slender but sturdy shaft, is brought into position at 90° to the hole centerline. The piece is automatically indexed for the complete work cycle.

Production rate for this particular application from both stations is 200 pcs/hr. A prior method, requiring five people, turned out only 400 pcs/day.

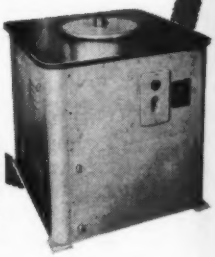
An electric clutch stops the machine with both cutters withdrawn for loading and unloading. Separate motors and controls are sup-



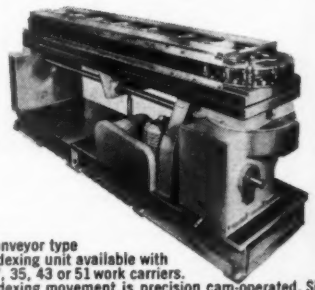
Basic cam-operated indexing unit for special purpose machine drive. Available in various sizes.

The basic units for AUTOMATIC assembly or production

...Standard Tool precision, proved cam-operated indexing units.



Basic cam-operated indexing unit incorporated in standard table with mechanical locking arrangement, timer and drive.



Conveyor type indexing unit available with 27, 35, 43 or 51 work carriers. Indexing movement is precision cam-operated. Side and top machine surfaces allow for ease of tool mounting. Furnished complete with drive.

1. *Reduces design time.*
2. *Permits rapid re-tooling when necessary.*
3. *Wide range of sizes and indexing increments.*

Standard Tool indexing units provide smooth, accurate positioning between automatic production stations. They are built for heavy duty operation and furnish the basic requirement for profitable automation. Engineers at Standard Tool are skilled in manufacture of completely automatic assembly and production machinery into which these indexing units are incorporated. Your inquiries will receive prompt, competent acknowledgement.

STANDARD TOOL & MANUFACTURING CO.

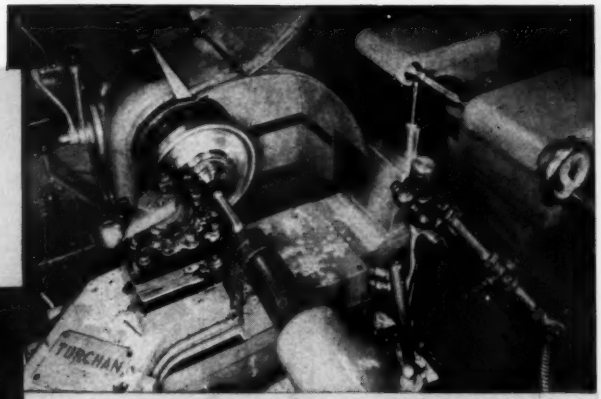
Creative Machine Designers and Builders Since 1910

KEARNY, NEW JERSEY

CIRCLE INFORM-A-GRAM KEY NO. 1242

Turchan HYDRAULIC TRACER CONTROLS

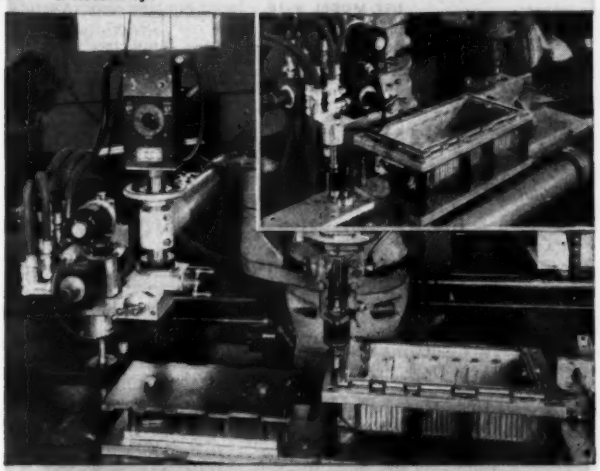
THE SIMPLEST SYSTEM OF MORE PROFITABLE PRODUCTION



Turchan tracers assure a finer finish. The smooth, continuous advance of the carriage by power feed, coupled with the floating action of the angular tool slide, produces a turned surface of unsurpassed smoothness. In many instances final grinding is unnecessary.

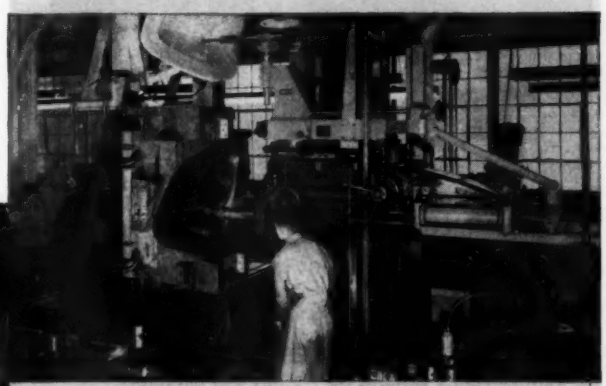
- TURNING
- MILLING
- BORING
- PLANING
- SHAPING

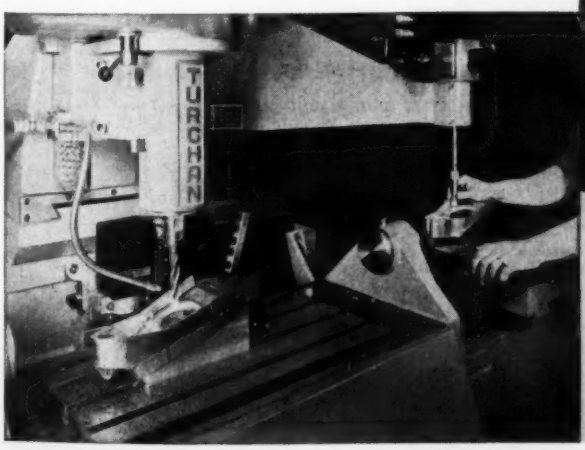
Machine tools equipped with Turchan tracer controls handle a greater variety of work faster and more accurately. Standard operation of the machine is possible by a simple switching mechanism which converts the machine quickly from straight work to intricate profiling and contouring and back again.



Complicated work requiring contouring, grooving and profiling are handled easily with Turchan Tracer control. In most cases many extra operations are reduced to one set-up.

TURCHAN
FOLLOWER MACHINE CO.
P. O. BOX 6055 • DEARBORN 9, MICH.





Turchan units are supplied complete. Installation is very simple and all installations are supervised by a Turchan engineer.

Write today for your Turchan Folders. If you have a production problem Turchan has the solution.

NEW HEAVY-DUTY BARREL FINISHING MACHINE SPEEDS PARTS OUTPUT

16 cu. ft. capacity with 1 to 4 compartments

FEATURES

- Direct belt and gear drive without chains and sprockets. Variable speed 8 to 25 rpm.
- Interchangeable barrels to fit any desired compartment make-up.
- Rugged, heavy-duty construction; No-Seam Vinyl-lined barrels.

USE MODEL V-16. Speed finishing work. Cut parts handling costs on small lots or continuous runs. Select individual barrel sizes to fit any desired combination of compartments. The V-16 Precision Barrel Finishing machine has many versatile features to meet your specific needs, assuring maximum output at lower cost. Engineering design is outstanding.

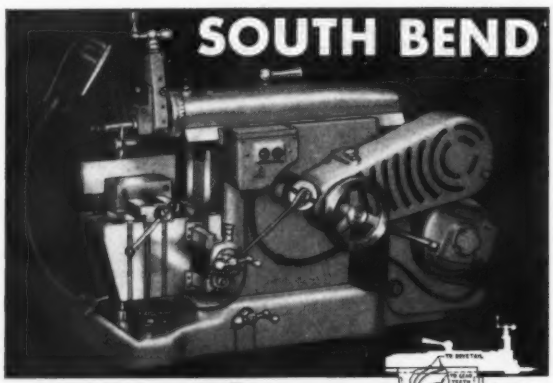
FULL DETAILS are available in new catalog data sheet "V-16". Write for your copy today.

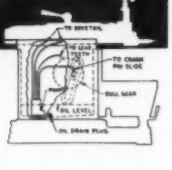
RAMPE MANUFACTURING CO.
14915 WOODWORTH AVE., CLEVELAND 10, OHIO

BARREL FINISHERS • SCREEN SEPARATORS • COMPOUNDS • NYLASLUGS

CIRCLE INFORM-A-GRAM KEY NO. 1261

SOUTH BEND





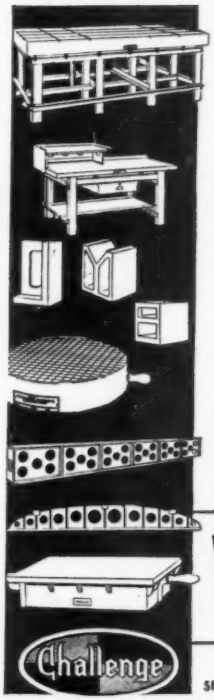
ONLY 7" Shaper with pressure lubrication

COMPARE THESE FEATURES:

- Extreme precision for the most exacting tolerances.
- Convenient controls for ease of operation.
- Ample bearing surfaces for rigidity and durability.
- Smooth, quiet operation at all speeds.
- Quick acting belt tension release.
- Sliding support shoe for outer end of table.
- Length of stroke adjustment 0 to 7".
- Reversible power cross-feeds .002" to .012".
- Swivel vise with graduated base.
- Price f.o.b. factory $573 less motor.

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906
CIRCLE INFORM-A-GRAM KEY NO. 1262

Over 300 types and sizes of PRECISION SURFACES for LAYOUT INSPECTION and ASSEMBLY



Close tolerance precision work demands Precision Surfaces, and Challenge offers the world's widest line of standard precision surface equipment. In addition, if your requirements include large, special surface or floor plates (in Semi-Steel or Granite), Challenge's Custom Engineering can plan and produce them for you.

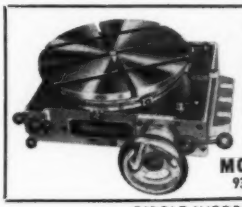
ASK FOR LATEST CHALLENGE CATALOG SHOWING THE MOST COMPLETE LINE OF

Angle Plates	Surface Plates	Straight Edges
V-Blocks	Floor Plates	Welding Tables
Box Parallels	Lapping Plates	Layout Plates
Angle Irons	Bench Plates	Work Benches

Handy new Catalog No. 838-W includes complete specifications and prices. See your Industrial Distributor or write Challenge for your free copy. Write Dept. TP-7

THE CHALLENGE MACHINERY COMPANY
SE-110 **Grand Haven, Michigan**

CIRCLE INFORM-A-GRAM KEY NO. 1263



NEW Advance 15" Rotary Table

has accuracy to within 30 seconds. This rugged piece of equipment is designed for all types of close tolerance work requiring rotational accuracy, with maximum speed and precision and minimum maintenance.

MORRISON ENGINEERING COMPANY
937 W. Lake St., Dept. A, Chicago 7, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1264

FOR RENT

Excellent tool and die shop location. 6,500 sq. ft. on ground floor, 3,000 sq. ft. in basement of reinforced concrete building. 220 v. and 440 v. wiring. Fluorescent lighting. 1540 East 49th Street, Cleveland. Apply: H. L. Kaplan, 1819 Lee Road, Cleveland; tel.: FAirmount 1-6425.

TECHNICAL BOOKS

MICROSTRUCTURES OF DIAMOND SURFACES by Tolansky. 11 chapters of original research in the field of diamond growth. New optical techniques explained. 143 special art plates. $8.50 per copy

DIAMOND TECHNOLOGY by Paul Grodzinski. 784 pages, 93 working tables, and over 486 photographs and drawings. The only standard work on the subject. $10.00 per copy

GEARS FOR SMALL MECHANISMS by W. O. Davis. 20 chapters profusely illustrated covering theory, design and practice of cutting and generating gear tooth forms. $5.00 per copy

COLD FORMING OF THE STAINLESS STEELS by Lester F. Spencer. A 28-page pamphlet on the subject. $1.00 per copy

MACHINING, HEAT TREATMENT & PICKLING OF STAINLESS by Lester F. Spencer. 36 pages on the working of stainless steel. $1.50 per copy

COMPANY PURCHASE ORDERS OR CASH, PLEASE. SORRY, NO C.O.D.'S

HUEBNER PUBLICATIONS, INC.
P.O. Box 3505, Cleveland 18, Ohio

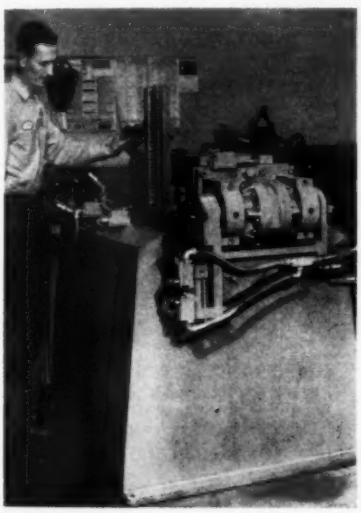
plied for each work station for maximum flexibility in operation.

The machine, developed by the Modern Engineering Company, is equipped with upper and lower cam-actuated rocker tool assemblies, and precision ball-bearing intermittent indexing assembly with provision for radial adjustment of pilot gear for work location.

TUBE BENDING MACHINE USES RECIPROCATING TORQUE ACTUATOR

Powered by a standard ROTAC torque actuator, Model 6-3, a tube-bending machine has been developed that produces automobile radiator parts at the rate of 1500 pcs/hr.

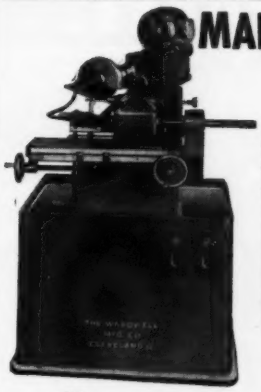
The entirely automatic machine cycles continuously to bend 2" lengths of ⅜" OD thin-wall copper tubing 180° without deforming the tube diameter. Conveyed from a rotary feed unit to a vertical magazine, the pieces are gravity-fed to a cylinder which thrusts them horizontally into a bending die. Another



cylinder, mounted on the bending die, clamps the parts. The entire die assembly, which is attached directly to the actuator shaft, is then rotated upward in a 180° arc by rotation of the bearing-mounted shaft. The part is automatically ejected on the downward arc and the cycle repeats. This machine was designed and built by Walter P. Hill, Inc.

The standard torque actuator built by Ex-Cell-O Corporation is shown on the machine. Operating at 500 psi, the unit is capable of 280° circular travel. The fluid used is an ordinary hydraulic oil.

Utilizing external travel stops and heavy-duty outboard bearings to take the overhung bending load, this application follows good design practice.



MAKE MONEY---SAVE MONEY

with WARDWELL'S Universal Automatic FLUTE GRINDER

GRINDS TOOLS LIKE THIS FROM SOLID!

Model 90FS

Make your own twist drills, spiral or straight reamers and end mills from solids on a production basis and save money.

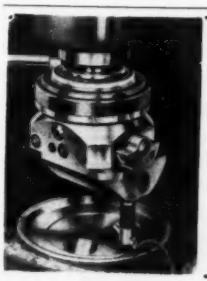
Also avoid costly delays when special drills or reamers are required. Make drills as small as 1/16". Indexes automatically. No special skill needed.

WARDWELL MANUFACTURING CO. 3809 Ridge Rd., Cleveland, O.

Descriptive Bulletin 90FS—Free

Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1271



Do you save money with several accuracy jeopardizing set-ups when one set-up could do your work? *We think not!*

BUT . . .

With our WOHLHAUPTER MASTERHEAD IN ONE SET-UP you do boring, facing, recessing, undercutting, turning, etc. on ONE machine and • Save considerable time • Increase production • Increase efficiency • Utilize your present machine park more economically. 9 models of the WOHLHAUPTER MASTERHEAD available with capacities up to 31¼".

All models have automatic feed and automatic end release

Multiple feed models have 12 slide feeds.

Also Automatic Tapercutting Heads for Angles 0-180°, inside and outside.

"Sole U.S.A. Representatives"

KARL A. NEISE 404 4th Ave., Dept. TP New York 10, N. Y.

NEISE MODERN TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1272

most VERSATILE PIN GAGES *made!*

Horberg exclusive taper feature lets you check undersize, oversize and odd-size holes, slots, etc., quickly and accurately with standard letter, number or drill-size gages.

A precision concentric taper on the lower half of each gage runs to 0.0012" smaller than gage size. You get a continuously accurate range of measurement with each gage, for quicker, handier, precision gaging in set-up, machining, tooling and inspection operations.

SPECIFICATIONS

Diameter accurate to +0.0001" —0.0000"
Standard 1.5" length
Concentric taper on lower half to .0012" smaller size
Oil hardened tool steel

PRICES AND ORDER FORM (F.O.B. Bridgeport, Conn.)

_____Letter sets—52 gages A-Z in pairs $65.00
_____Fraction sets—60 gages 3/64" to 1/2" in pairs $75.00
_____Number sets—120 gages 1-60 in pairs $130.00
_____Single gages_____size ea. $1.50

Sets furnished in indexed plastic case. Extra case $15.00
Prices subject to change without notice.

Please rush items checked to:

Name_____

Company_____

Address_____

Horberg GAGE COMPANY 29 Staples St., Bridgeport, Conn.

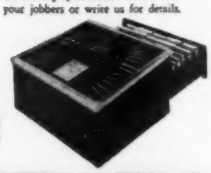
CIRCLE INFORM-A-GRAM KEY NO. 1273

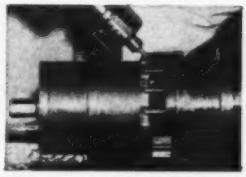
MICRO-MINIATURES...

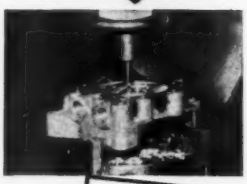
Small
END MILLS AND ROUTER BITS
Ground from SOLID. Made to do a NEW job of milling and routing at high speed and fast feed on production runs as well as in the tool room.

THE SECRET
of their durability and long life lies in our method of grinding which produces a smooth, unbroken cutting edge. No saw-tooth edge to load-up and break-down.

See the display of Micro-Miniatures at your jobbers or write us for details.







DISTRIBUTORS *in principal cities*

When you think of small END MILLS — think of MICRO MINIATURES

Write for Catalog

WOODSON TOOL CO. 4811 Lennox Blvd. Inglewood, Calif.

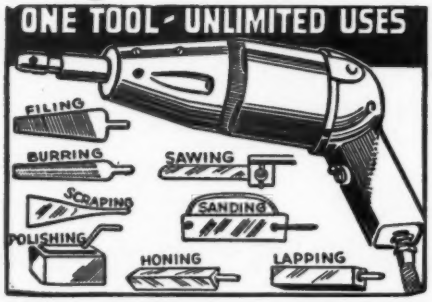
CIRCLE INFORM-A-GRAM KEY NO. 1281

B-R-E-A-K...
Hand Finishing Bottlenecks

WITH OUR
PORTABLE ELECTRIC
RECIPROCATING TOOL

This handy tool will cut out many tedious hand filing and finishing operations — Increase Production — Produce Uniform Work.

Light in weight — Delivers 1/8" or 3/8" fixed stroke at 1000 strokes per minute — Operates on 110 volts AC or DC.



ACME TOOL COMPANY

75 WEST BROADWAY NEW YORK 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1282

Tomco

HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

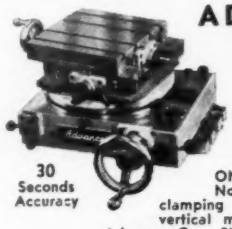
Write for literature

Tomco PRODUCTS CO
1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 1283

ADVANCE



CROSS-SLIDE ROTARY TABLE

Permits fast precise positioning of workpiece from ONE Set-Up.

30 Seconds Accuracy

No unclamping or reclamping on your standard vertical mill equipped with Advance Cross-Slide Rotary Table.

MORRISON ENGINEERING COMPANY
937 West Lake Street, Dept. A1, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1284

NEW WELDAMATION CONCEPT INTRODUCED IN AUTOMATED MACHINE

"Weldamation", a recently conceived, automated production concept is found in this 7-station in-line processing machine. As developed by the Expert Automation Machine Co., metalworking machining operations are combined with those of welding, assembly and testing in a single automated machine.

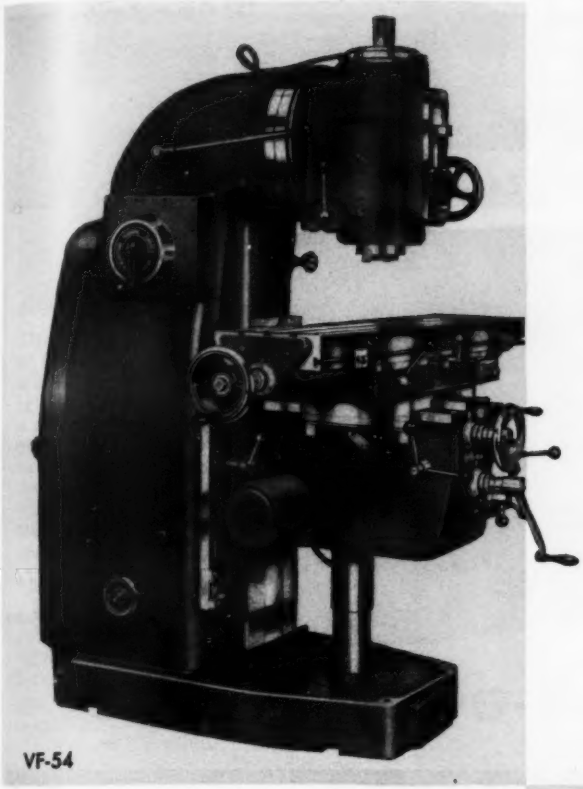
Weldamation concepts can be included in special machines of either in-line or rotary index types depending on the individual part specifications and production requirements.

This first machine assembles and welds a flange to one end of a steel tube, performs three separate machining operations on the other end of the tube, and tests the finished tubular steel automotive steering column assemblies at a production rate of 400 units/hr.

Adjustments are provided on the machine to permit the handling of two different tube and flange components. Thus, by allowing for a short change-over period, the machine can produce the necessary production requirements for two completely different steering column assemblies.

This machine utilizes modular construction which allows additional stations to be incorporated in the machine without costly and long model change-over times.

An automatic tube loading mechanism transfers the tubes from a hopper to a longitudinally reciprocating transfer bar mechanism. The transfer bar mechanism carries the parts through the assembly, welding, machining and testing stations and deposits the completed assembly on an awaiting conveyor.



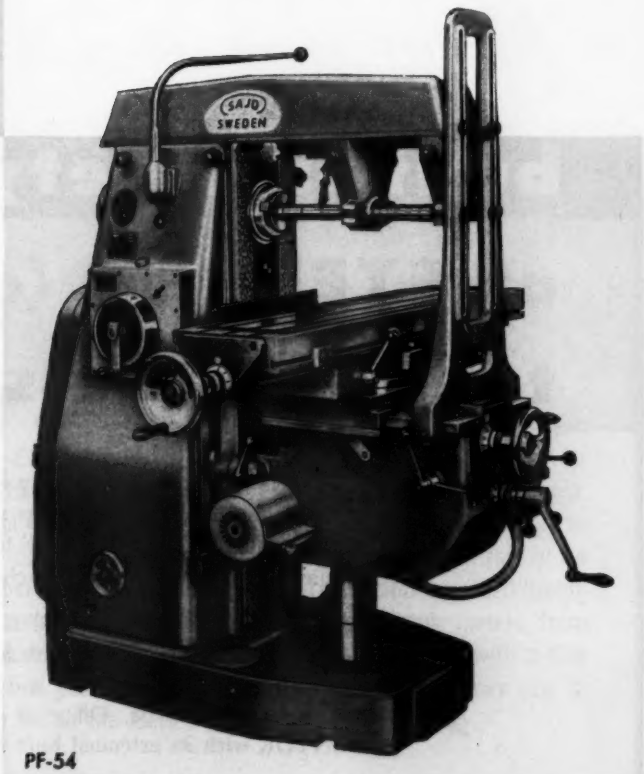
VF-54

ONLY SWEDISH CRAFTSMEN

Can Build These Precision Millers At Such Surprisingly Low Cost

HORIZONTAL AND VERTICAL SAJO MILLERS

Built to U.S. Standards, Sajo Millers with proven production records in modern industry are available in both plain and universal models. Installation references in your vicinity on request.



PF-54

Standard Duty #2 (Model 54) ALL GEARED Millers—

Plain, Universal and Vertical—table 52" x 11", 7½ HP with power feeds (longitudinal 33½") and power rapid traverse.

•

Light Duty #2 (Model 53) ALL GEARED Millers—

Plain and Universal—table 41⅜" x 9¼" —3½ HP with power feeds (longitudinal 24½").

Light Duty #2 (Model 48) Utility Millers—

Plain and Universal—table 41⅜" x 9¼" —3½ HP with power feeds (longitudinal 24½").

austin INDUSTRIAL CORPORATION

76-X MAMARONECK AVENUE • WHITE PLAINS, NEW YORK

HORIZONTAL AND VERTICAL SHAPERS • POWER HACKSAWS

FAST SERVICE AND PARTS AVAILABLE FROM MAJOR CITIES, WRITE FOR CATALOGS

CIRCLE INFORM-A-GRAM KEY NO. 129

now . . .

Carpenter e-x-t-e-n-d-s the built-in safety factor of STENTOR (oil-hard) tool and die steel!

Remarkable heat treating versatility found in no other oil-hardening, non-deforming tool steel, now assures extra cost-savings with Carpenter STENTOR (Oil-Hard). A broader, safe hardening range from 1425° F to 1525° F makes it possible to fit STENTOR tools and dies into many heat treating schedules during the average day.

Make your own evaluation. Add this extended built-in factor of safety to the other cost-saving advantages you get with STENTOR: easy machinability, less size change and distortion, uniform hardenability and freedom from decarb. Then call your local Carpenter Mill-Branch Warehouse, Office or Distributor for information and *rush delivery* on STENTOR with its extended built-in factor of safety.

Carpenter STEEL

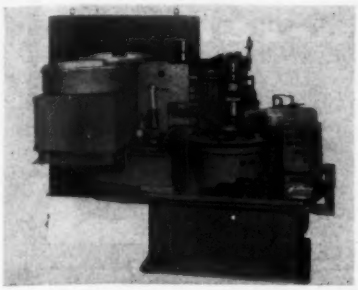
matched tool and die steels

The Carpenter Steel Co., 106 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

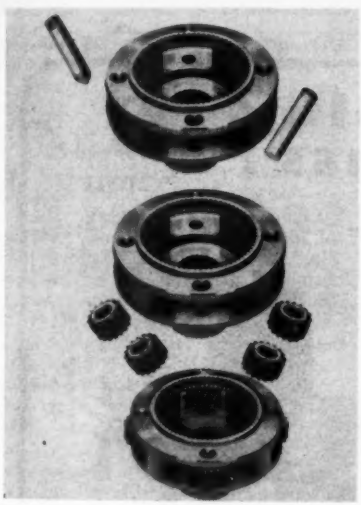
CIRCLE INFORM-A-GRAM KEY NO. 130

. . . Machine from page 122



The 2nd station checks the press fit of each pin, automatically informing a built-in memory circuit in the electrical system if a pin does not resist a predetermined pressure. This memory circuit causes defective assembles to be ejected automatically at the 3rd station. Acceptable assemblies continue without interference through this station to the 4th, where the pins are staked at each end to make a permanent assembly.

Fixtures float freely over the index table and ride up on stationary anvils at the operating stations, thus eliminating pressure on the index table. Positive alignment is assured at each station by hardened locating pins, which pick up locating bushings in the fixtures. In addition to automatic and manual "Start" and "Stop" buttons, the control panel has buttons



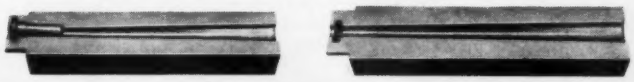
that control individual machine movements, as well as offering forward and backward inching control of the table. A red light on the panel flashes whenever an assembly is rejected.

All stations on the machine are hydraulically operated and have complete electrical interlock. Hydraulic and electrical equipment conforms to J.I.C. standards. The machine is normally cycled to complete 720 assemblies/hr at 100% efficiency with manual loading. This machine was designed and built by the Omer E. Robbins Company.

TAPERING THE MODERN WAY

15" TAPERS IN A SINGLE PASS

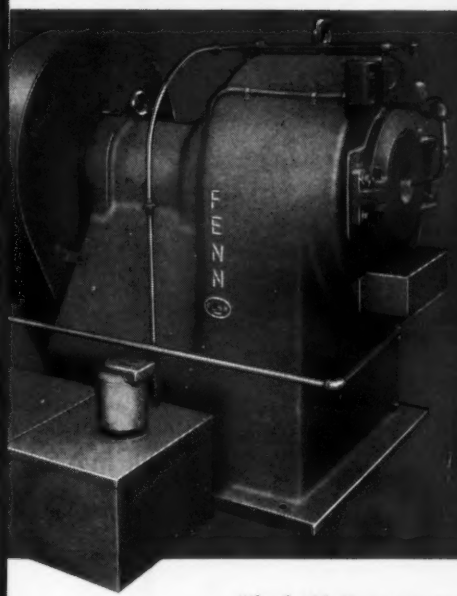
WITH THESE DIES . . .



and this

FENN

Long Die SWAGING MACHINE



It's fast! It saves metal and money. Fenn Long-Die Rotary Swaging greatly simplifies the production of long tapered tubular products (such as tubular furniture legs). Model 4½F will produce tapers up to 15" long on tubing up to 2¼" diameter in a single pass and at a production rate of up to 6 per minute with manual feed. This includes welded tubing and seamless tubing on ferrous or nonferrous metals, from stainless to aluminum. Work leaves the machine with a fine finish. If your product requires tapering, it will pay you to write for all the facts on Fenn Long-Die Swaging.

FENN LONG DIE Swaging Machines

FENN MANUFACTURING CO.
203 Fenn St., Newington, Conn.
CIRCLE INFORM-A-GRAM KEY NO. 131

YOU CAN SET CUTS FASTER
with
MAXWELL-MADE
E-Z SET BORING TOOLS

Maxwell E-Z Set Boring Tools can be adjusted faster for different diameters than similar tools. This is accomplished by simply rotating the precision calibrated micrometer-like dial which causes tool block to feed radially out or in, and provides boring accuracy to within .0002-inch.

3 POSITION BORING BAR PROVIDES MAXIMUM CAPACITY

Maximum safety of operation and ease of handling is assured by smooth circular shape. Interchangeable shanks facilitate use of E-Z Set Boring Tools in turret lathe, jig bore, milling machine, boring mill, automatic or other machine tools. Three types are available having maximum boring bar capacities of ½", 1" and 1½", and covering a boring range from ⅜" to 20".

WRITE TODAY FOR E-Z SET BORING TOOL CATALOG
393R-MC

THE MAXWELL COMPANY
MACEDONIA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1321

KNU-VISE
insta-release
PLIERS:

Model LUP-1200 shown

easy to open—quick to re-clamp

insta-release —that's the name for the easy-action release-lever Knu-Vise pliers. Pliers open instantly re-clamp quickly—easily—without waste motion.

Maintains control over the free-swinging handle—permitting re-clamping with the same grip. Always remains within the hand span of the user.

Flip it over and you have instant release in the other direction. The Knu-Vise *insta-release* lever is available on P-1200 and P-1800 Series pliers.

Remember: Every model of the more than 150 *Knu-Vise* clamps is quick to lock—and quick to open. Ask for a demonstration.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS LAPEER MANUFACTURING CO.
3064 DAVISON ROAD • LAPEER, MICHIGAN
WESTERN DIVISION, 422 Magnolia, Glendale, California • CANADIAN DIVISION Heggenson Engr., Hamilton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 1323

You CAN
take it with you
... or use it
in the shop

THE VERSATILE
WELLS 49A
METAL CUTTING
BAND SAW

As a horizontal cut-off saw

As a vertical band saw

Use the Wells 49A in the shop, or take it to the "job-site"—you'll find it an efficient tool—a time and money saver on a wide variety of metal cutting jobs.

As a horizontal cut-off tool it has a capacity of 3½" x 6". One easy motion converts it to a vertical band saw. No tools required! Just swing the head into upright position—it's ready to use. Cut angles, slots, do light contour work.

Get TWO saws for the price of ONE! Write for complete information.

Wells

The Pioneers of Horizontal
METAL CUTTING
BAND SAWS

1940 Cedar Street
Three River, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1322

MAKES BIG NOTCHES OR LITTLE ONES...

24"
9"
12½"
2½"
3⅝"
21¼"

WHITNEY-JENSEN No. 100
HAND METAL NOTCHER

Capacity, 90° notch 4¼" deep in 16-ga. mild steel. V-ram with adjustable gibs assures positive blade and die alignment. Aviation type bearings for smooth and easy operation. A useful, versatile tool for any metal shop.

WHITNEY METAL TOOL COMPANY
710 Forbes St., Rockford, Ill. Since 1910

CIRCLE INFORM-A-GRAM KEY NO. 1324

AUTOMATICALLY LOADING GEARS FOR HEAT TREATING

A new materials handling unit for the automatic skew loading of gears prior to heat treating, has been developed and built by the Gear-O-Mation Division, Michigan Tool Company. With the new "Skew Loader", an operator can load 4200 gears/hr onto a gear carrier.

In operation, the gears enter the skew loader through a gravity expandable track and are stopped by an escapement mechanism. From the escapement, gears are fed one at a time into a V-track and are pushed forward by the plunger of an air

cylinder actuated by a proximity switch. The air cylinder, returning to neutral, triggers a limit switch-controlled solenoid which releases another gear. This action takes place in split seconds — an average skew load of about 14 gears is readied in less than 5 sec.

When a full load is positioned, the operator merely inserts the skew (or rod) through the centerbored holes and lifts the load onto a gear carrier. Operator action is almost continuous at the loader's high speed.

Versatility is also an important feature of Gear-O-Mation's Skew Loader. It not only will load much-alike gears but can be converted to much bigger or smaller gears simply by changing the retaining fixtures. Pushbutton controlled, the unit can be run manually as well as on full automatic.

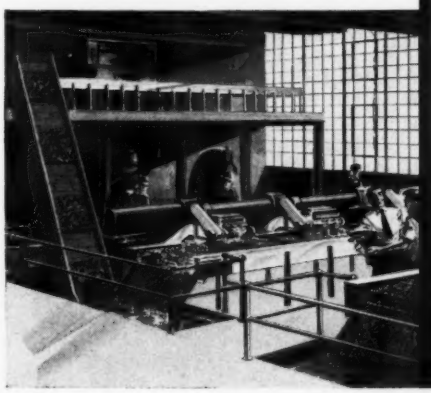
———•———

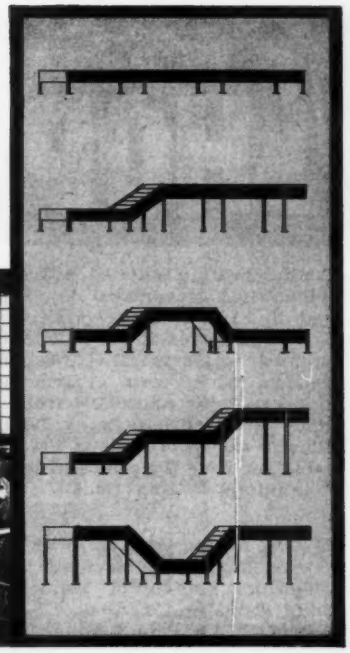
Alva Allen Industries has purchased the Canadian and American patent rights of the Marvel milling attachment for lathes from the designer, Michael Hanna. This attachment is easily installed on practically any conventional lathe for performing many milling operations such as keyseating, grinding, milling, drilling, and boring. It has been redesigned to improve stability and dependability, and to permit quantity production.

———•———

MAY-FRAN

CONVEYOR STANDARDIZATION





. . . SAVES YOU MONEY

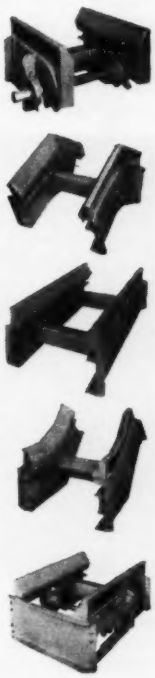
. . . NOW AND IN THE FUTURE!

Here is a conveyor program designed for the unusual. NOW . . . you can have a customized conveyor today to meet production needs . . . and with modification, that same conveyor will meet the needs of tomorrow.

The May-Fran conveyor standardization program provides the standard components that can be assembled to form a special or standard conveyor. These same components can be re-arranged at any time to solve production problems in the future.

In addition, standard components mass produced mean conveyor economy right from the beginning.

Here is a conveyor program of standardization program that saves you money now . . . and in the future!



Write today for your copy of Bulletin MF-200

7220-MF

MAY-FRAN ENGINEERING, INC.

1726 CLARKSTONE RD.
CLEVELAND 12, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 133

SHOP AIDS

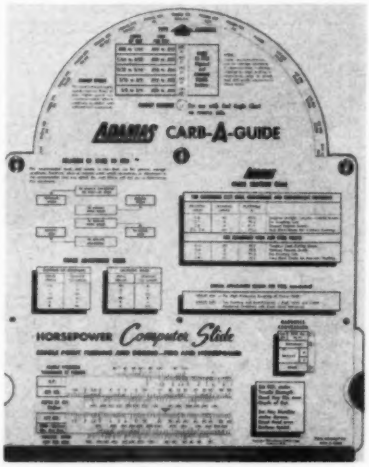
An Engineering Bulletin on Grinding Cemented Carbides has been prepared by Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6. Presented are comparative removal rates and wheel costs in grinding carbides with the Anocut electrolytic method and conventional grinding methods. Copies of Bulletin 104 can be obtained from the company, or — **Circle Inform-A-Gram No. C1.**

21 Cost Saving Case Histories are presented in a booklet on Honite barrel finishing put out by Minnesota Mining and Mfg. Co., Dept. F7-113, 900 Bush St., St. Paul 6, Minn. The illustrated booklet contains before-and-after pictures of a variety of parts, as well as charts indexing types of media and compounds, and their uses. **Circle No. C2.**

A Handbook on Toolroom Grinding can be obtained from Norton Co., Worcester 6, Mass. It aids in the proper selection and use of grinding wheels and presents methods of grinding various types of tools and cutters — carbide, high speed steel, and cast alloy types. Sections in the handbook cover wheels for toolroom grinding, sharpening high speed steel

and cast alloy multi-tooth cutters, grinding the chip breaker on carbide tools, and hand honing of carbide tools. Also discussed are sharpening miscellaneous high-speed steel tools, toolroom and carbide grinding operations, and Norton Grinding machines for the toolroom. In addition, there is a section of tables.
Circle Inform-A-Gram No. C3.

This Carb-A-Guide has been released by Adamas Carbide Corp., Kenilworth, N. J. Presented are recommended feeds and speeds for various materials. Also given are tables to aid grade adjustment and selection, and a horsepower computer



slide for single point turning and boring tools. Other charts give chip breaker recommendations for parallel and angular types and recommended tool angles. Copies of the Carb-A-Guide can be obtained from the company, or —
Circle Inform-A-Gram No. C4.

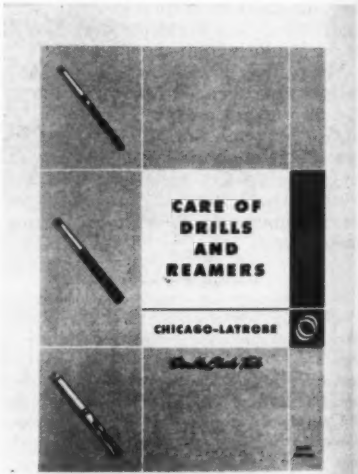
Proposed 1957 Revision Unified and American Screw Threads ASA B1.1 is presented in "Die Headlines," Vol. IV, No. 6 issued by The Eastern Machine Screw Corp., New Haven 6, Conn. It gives the major, minor, and pitch diameters, listing classes, allowances, and tolerances of all internal and external threads up to and including 2". Obtain your copy from the firm, or —
Circle Inform-A-Gram No. C5.

Titanium Metal Pipe and Tubing are detailed in Technical Data Folder TDC-185 released by The Babcock & Wilcox Co., Beaver Falls, Pa. Presented in detail are the size range and tolerance of the seamless metal pipe and tubing. In addition, the folder gives a complete description of the mechanical, physical, and working properties of the metal in tubular form. Also covered in the folder are fabrication and heat treatment. The company will supply copies of the folder, or — **Circle No. C6.**

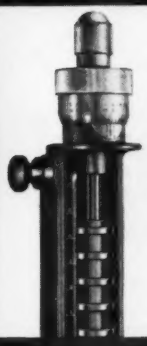
A Design Manual contains tips for design engineers on the savings possible with stud welding. The manual includes full descriptions and physical properties of the various stud types, including the new standard CP stud. Also found in the manual are sections on stud selection, counterbore and countersink dimensions for accommodating weld fillets, recommended thicknesses of steel on which studs are welded, and stud locating procedures, including template design. Nelson Stud Welding Div'n, Gregory Industries, Inc., Lorain, O., will fill requests for copies of the 24-page Design Manual, or — **Circle Inform-A-Gram No. C7.**

A Technical Data Bulletin on Clad Metals, contact materials, and contact assemblies has been issued by American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y. Topics covered include cost and materials savings with clad metals, types of clad metals, and specific applications. Included is a Clad Metal Finder Chart showing the types of clad metals available, their design and engineering functions, and applications. Write to the company for your copy of Technical Data Bulletin CM-901, or—**Circle Inform-A-Gram No. C8.**

A Drill and Reamer Care Folder contains complete technical data for using, sharpening, and handling of either high speed or carbide steel



drills and reamers. Copies of the illustrated folder are made available by Chicago-Latrobe, 411 W. Ontario St., Chicago 10, or — **Circle No. C9.**



MICROMETER THIMBLE is graduated to .0001" and provides dimensions between 1" steps on measuring bar. Measuring bar can be adjusted to enable the user to take readings up or down relative to a center line or other reference line on the work.

accurate to .00005" throughout the 18" range

That's right! Just 10 seconds to set this NEW 18" PLA-CHEK GAGE . . . and you are ready to start your inspections. In hundreds of installations on innumerable jobs PLA-CHEK GAGES are daily proving their time-saving and money-saving advantages. Extremely easy to operate—no auxiliary gage blocks are necessary—this PLA-CHEK 18" model guarantees accuracy to fifty millionths through its entire range. The measuring bar is made of deep-frozen, strain-free alloy steel. Because it is of one-piece construction the steps cannot change or separate with age. Since it is not necessary to touch the measuring bar, body heat does not affect it. Return the coupon or write TODAY for literature and complete details.

Cadillac PLA-CHEK GAGES are available in a complete range of sizes: 6", 12", 18", 24", 36", and 48" models. Precision-made risers, increasing the range of each model, are also available.

Cadillac
GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN

MAIL THIS COUPON FOR COMPLETE DATA

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 135

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Abrasive Shot and Grit are featured in a catalog from Abrasive Shot and Grit Co., Springville, N. Y. Included are SAE specifications, methods, and proper abrasive mixtures for shot peening and impact cleaning. Also listed are the characteristics, considerations, and important uses for the firm's entire line. For your copy of Catalog ASG357, write to the company, or —
Circle Inform-A-Gram No. B1.

Continuous Production Plus Precise Control are provided by a mesh belt conveyor furnace for use with a controlled atmosphere. Zoned heating provides required temperatures in the furnace chamber. The time that the work is in the furnace can be controlled by a variable speed drive. For complete details, obtain Bulletin 357 from Hevi-Duty Electric Co., Milwaukee 1, or —
Circle Inform-A-Gram No. B2.

Detail of drum turret showing six spindles

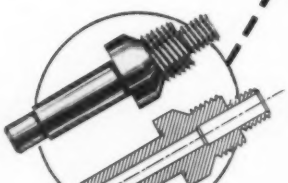
TURRET LATHE
VERSATILITY
added to
SWISS AUTOMATIC PRECISION

ONE MACHINE COMBINES
6-SPINDLE AXIAL DRUM TURRET
WITH 5 CROSS TOOLS

BECHLER
SWISS AUTOMATICS

This remarkable combination has resulted in a Swiss Automatic of tremendous versatility. Addition of a six-station drum turret permits a wide variety of set-ups with *simple, standard* tools. The 11 separate tool stations permit production of completely finished, precision parts. Secondary operations are eliminated—output is increased—yet the precise performance of standard Swiss Automatics is retained. These machines are available in three sizes with capacities up to 1-1/4 inches.

Bechler Model AR-10
3/8" diameter capacity
5 Cross Tools—
6 Turret Stations



Steel precision part produced on AR-10. Diameter—.250", length—.750", 1 single and 1 double lead thread, recess and taper behind shoulder, bores concentric with outside diameters.

TURRET FEATURES

- Six adjustable spindles—rotating or stationary—for centering, drilling, reaming, threading and tapping. Up to 4 of these spindles can be tooled for internal or external threads—right, left or mixed.
- Rapid, hydraulic spindle indexing—operated by standard, adjustable trip dogs instead of indexing cams.
- Accurate tool alignment—turret is securely locked on an extra large disc.
- Idle spindle travel reduced—horizontal turret positioned to suit length of workpiece.

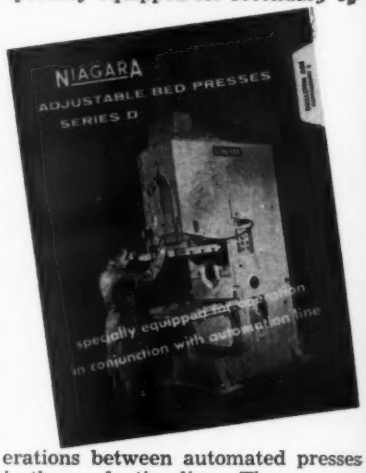
COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

Factory Service: — Bechler Service Corporation — 28 Harbor Street, Stamford, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 136

Redesigned Adjustable Bed Presses are the subject of Bulletin 60E Supplement announced by Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11. These presses are specially equipped for secondary operations between automated presses in the production line. There are no overhanging or protruding components. The presses can be hoisted easily or readily moved on skid type feet. For details, get the literature from the company, or —
Circle Inform-A-Gram No. B3.



Application, Physical Properties, Brazing, and Grinding of Firthite NHA are covered in a bulletin from Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30. Cast histories of this high production, general purpose carbide are also included in the bulletin. Direct requests for copies of the bulletin to the company, or —
Circle Inform-A-Gram No. B4.

Six Major Filter Types for Industrial Applications are featured in the General Bulletin offered by Industrial Filtration Co., Dept. GB-299, Lebanon, Ind. Included are the disposable media gravity type, combination gravity and magnetic, straight magnetic, vacuum, pressure, and screen-type settling filters. Their operation is covered as well as applications, degree of filtration, and flow rate capacities.
Circle Inform-A-Gram No. B5.

Easily Setup for Turning, Boring, or Facing is the J & L precision boring machine. This machine is ideal for long or short runs and has a single or double spindle. A bulletin lists the features of the machine and illustrates the advantages. Also given are the specifications. Jones & Lamson Machine Co., Springfield, Vt., will provide copies of Bulletin 5705 with complete information, or—
Circle Inform-A-Gram No. B6.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Large Capacity at Low Cost is a feature of new No. 17 10" x 16" hand feed surface grinder. This grinder handles die block and general toolroom work. Setup time and operating effort are reduced and accuracy is increased by its advance design features. An illustrated bulletin lists and points out the advantages of the grinder and gives specifications. Covel Mfg. Co., Benton Harbor, Mich., will supply copies of Bulletin 177, or —
Circle Inform-A-Gram No. B7.

1170 Series of Air Powered Small Wheel Grinders is featured in Bulletin 59 from Rotor Tool Co., Cleveland 32. Included are the short, small end, and long types. The bulletin illustrates the spindles, collets, arbors, and throttles available. A large cut-away photo is used to point out the features of the tools. Also presented are the specifications. Copies of the bulletin are provided by the company, or —
Circle Inform-A-Gram No. B8.

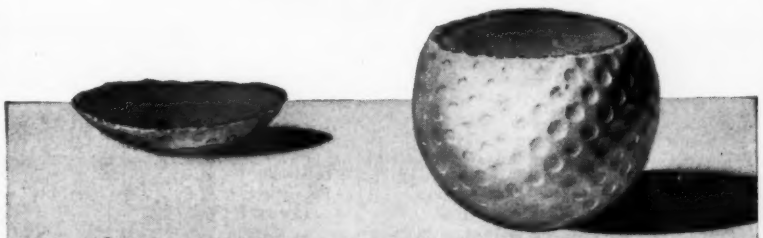
Sanding, Polishing, Deburring, and Other Finishing Operations are performed by the Vonnegut brush-backed polishing head. It is used on flat, formed, curved, and irregularly shaped surfaces; and for machined, pressed, stamped, fabricated, and molded parts. A bulletin shows typical applications of the polishing head and gives ordering information. Grinding and Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, will supply copies of Bulletin 102, or —
Circle Inform-A-Gram No. B9.

A Complete Line of Punching and Notching Units is detailed in a 72-page illustrated manual released by Toolset, Inc., 1411 Military Rd., Buffalo 17, N. Y. Included is dimensional data on hole diameters, hole centers, die heights, shut heights, and tonnage capacities. In addition, the application of the Peg Board System for simplifying tooling and setup is outlined. The company will supply copies of the manual, or —
Circle Inform-A-Gram No. B10.

"The McGill Handy Book of Electrical Specialties" covers levolier switches, industrial sockets, and portable lamp guards. Each item is illustrated and described, and ordering information given. For your copy of the pocket-size Handy Book, write to McGill Mfg. Co., Inc., Electrical Div'n, Valparaiso, Ind., or —
Circle Inform-A-Gram No. B11.

A Unique Principle of Guiding the Tool Instead of the Work is explained in a brochure describing Model 5 contour sawing machine. The machine will perform cuts of any complexity over a 70-sq-ft working range while the work remains stationary. Specifications and design features are included in Brochure 56-59 made available by The DoAll Co., Des Plaines, Ill., or —
Circle Inform-A-Gram No. B12.

14 Advantages of the No. 2 Geared Electric Turret Lathe are listed in a folder published by Bardons & Oliver, Inc., 1133 W. 9th St., Cleveland 13. The lathe has a 1" bar capacity for average duty and a 1¼" capacity for light duty. The bulletin, in addition, details the machine's features, complete with illustrations. Also given is a complete table of specifications.
Circle Inform-A-Gram No. B13.



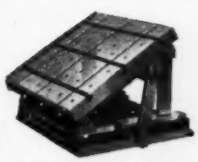
INVEST ONE-TENTH THE COST OF A GOLF BALL . . .

START SAVING DOLLARS IN YOUR TOOLROOM . . . *Now!*

Robbins angular tooling equipment often pays for itself the first few times you use it . . . but let's be conservative. Let's talk about writing off the cost over ten years. (About half the useful life of a "Magna-Sine!") Written off in this manner, the Model A-5 Magna-Sine illustrated represents an investment of around twelve cents a day!

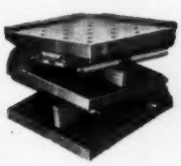
This equipment saves dollars of valuable toolroom time on every job. Set-ups that require *hours* by other methods take just *minutes* the Robbins way. Set up to machine, grind or inspect any angle in just four simple steps: (1) Look up required angle in Table of Constants furnished with unit, (2) Select gage blocks indicated, (3) Place blocks between base and sine bar swivel block, (4) Secure the work . . . and you're ready to go!

This simple, fast, sure method sets up any angle, single or compound, right or left hand, without V-blocks, angle plates or complicated "build-ups." Complete range of models and sizes puts Robbins precision equipment within the reach of every shop. Write now for literature.



HEAVY DUTY SINE PLATE FOR MACHINING

"MAGNA-SINE" WITH MAGNETIC TABLE

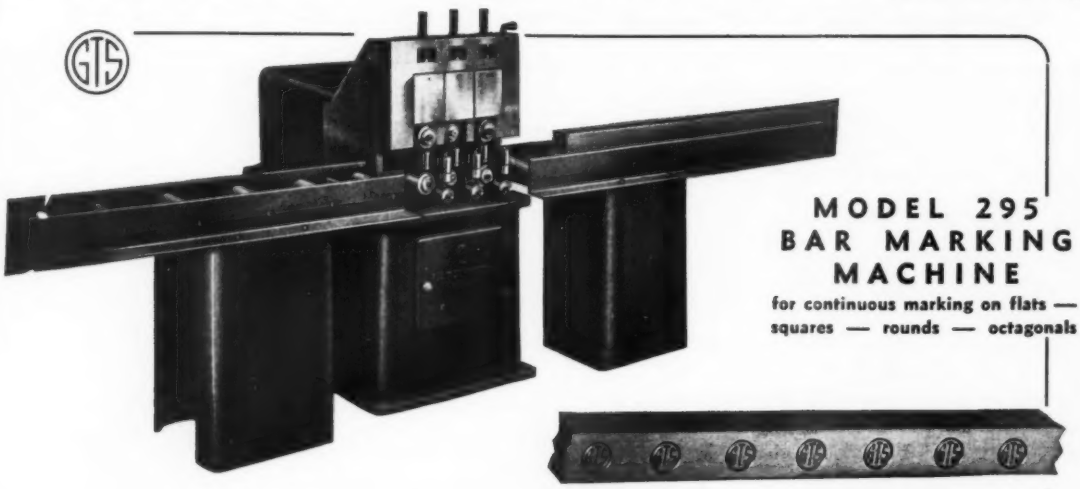


FOR INSPECTION AND LIGHT MACHINING

OMER E. Robbins COMPANY
24800 PLYMOUTH ROAD DEPT. C DETROIT 39, MICH.
Also manufacturers of special machinery, automatic assembly machinery. 9937

CIRCLE INFORM-A-GRAM KEY NO. 137

Precision . . . Speed . . . Versatility



MODEL 295 BAR MARKING MACHINE

for continuous marking on flats — squares — rounds — octagonals

Simple horizontal and vertical adjustments on this unit fix the work for precision operation. Bars may be marked on one side only or on opposite faces. Intermittent marking is obtainable at desired intervals up to 9 in. Lettering knurls can be quickly changed by removing a single screw. Feed and discharge roller bearing tables are available with the unit.
Write today for full information on Model 295, or any part of the famous GTS line of marking equipment.

GEO. T. SCHMIDT, INC.
4112 Ravenswood Avenue
Chicago 13, Illinois

If it's Worth Making, It's Worth Marking.

CIRCLE INFORM-A-GRAM KEY NO. 1381

Remote control or movement duplication your problem? find out why...

Sperry

Hydraulic REMOTE CONTROLS *are your best answer*

TP-7

SPERRY PRODUCTS, INC.
1103 Shelter Rock Road
Danbury, Connecticut

☐ Send complete hydraulic control information
☐ Have technical representative call

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 1382

Gage Company **PRECISION PLASTIC**

COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

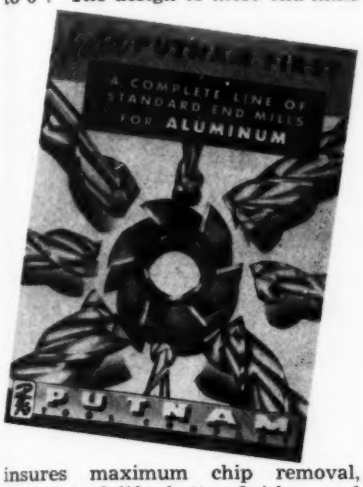
An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

WRITE FOR BULLETIN NO. 54-1511

GAGE COMPANY
BATTLE CREEK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1383

Designed for Milling Aluminum is a complete line of standard end mills. Included in the line are 2, 3, 4, and 6 flute designs, square nose and ball nose types; shell end mills; standard and Postiv-Lok shanks; lengths from 2½" to 11⅝"; and diameters from ¼" to 6". The design of these end mills



insures maximum chip removal, longer tool life, better finishes, and free cutting. Details are found in Catalog 457 put out by Putnam Tool Co., 2981 Charlevoix Ave., Detroit 7, or —
Circle Inform-A-Gram No. B14.

Gold Band Live Centers are highlighted in Folder Y223 released by Ideal Industries, Inc., Sycamore, Ill. Four types are shown and described — multi-duty, universal, heavy-duty, and pipe point. Also covered in the folder are etchers, an electric marker, demagnetizers, and tachometers. On the back of the folder is found a chart indicating the comparative load ratings of Ideal live centers. Copies of the folder are made available by the company, or —
Circle Inform-A-Gram No. B15.

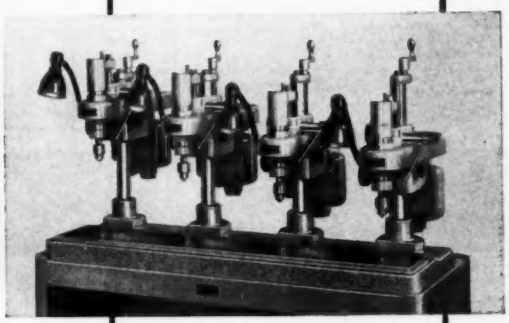
"Atlantic Dies for Better Production" presents a number of examples of progressive stampings produced from dies designed and built by Atlantic Tool & Die Co., 1374 Highland Ave., Lakewood 7, O. The bulletin illustrates and describes the company's modern facilities and equipment for producing progressive, lamination, and carbide dies. For copies of the bulletin, contact the company, or —
Circle Inform-A-Gram No. B16.

The Certain Curtain Built-In Atmosphere Control Method used on standard heat treating furnaces is discussed in Bulletin 5702 published by C. I. Hayes, Inc., 800 Wellington Ave., Cranston 10, R. I. The bulletin tells how the control operates to maintain effective protection during the heat treatment of most standard brands of steel, and while annealing some non-ferrous metals.
Circle Inform-A-Gram No. B17.

Powder Metallurgy is the subject of two publications recently released by Asco Sintering Corp., 7799 Telegraph Rd., Los Angeles 22. Catalog 57 covers self-lubricating oil impregnated bronze and iron bearings of standard sizes. A brochure, "Evolution of Powdered Metal," discusses in general the average products of powdered metal. In addition, it describes the company's facilities. For complete details, both publications can be obtained from the company, or—**Circle Inform-A-Gram No. B18.**

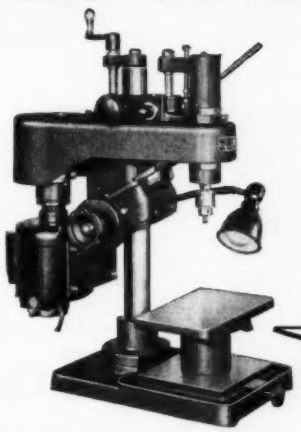
"ALX Alloy Tool Bits" details tool bits made of a cutting non-ferrous alloy containing boron. The bulletin covers the analysis, applications, grinding, tool angles, speeds and feeds, brazing, and ordering information. The principle uses of the tool bits include single point cutting tools on lathes, planers, shapers, boring mills, and automatic screw machine tools. Copies of the bulletin are provided by Allegheny Ludlum Steel Corp., Pittsburgh 22, or —
Circle Inform-A-Gram No. B19.

HAMILTON
SUPER SENSITIVE, SMALL-HOLE
PRECISION
REPEAT
PRECISION
DRILLING MACHINES



"for the finest work you do"

SINGLE OR MULTIPLE SPINDLES • VARIOUS CAPACITIES • WIDE RANGE OF CLEARANCES • VARIABLE SPINDLE SPEEDS • COMPANION TAPPING MACHINES



Designed and built to *master* the heart-breaking jobs which are so often attempted on drilling machines of "standard" accuracy.

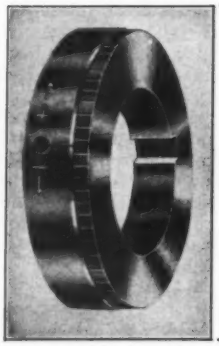
YOU
will want full information!
WE WILL SUPPLY IT
FREE
ask for
BULLETIN No. 2467
ADDRESS

THE HAMILTON TOOL COMPANY
832 South Ninth Street
HAMILTON, OHIO

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

2467

CIRCLE INFORM-A-GRAM KEY NO. 139



MILLING MACHINE SPACING COLLARS

SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
⅞	1-9/16	$12.75
1	1-13/16	12.75
1¼	2-1/16	13.25
1½	2-7/16	13.25
1¾	2-3/4	16.75
2	3-1/16	19.50

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1401

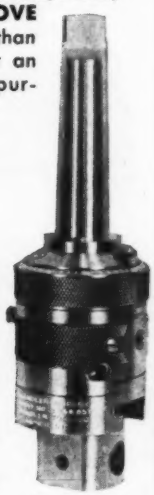
THINK of it!

NOW you can have a boring head that will **BORE, FACE, TURN** and **GROOVE** at no higher cost than you would pay for an ordinary, single purpose boring head.

THINK

This over before buying that NEW head!!

A Boring Head That Won't Face is NOT Complete



Model "D"

Models for Any Size Machine

Write today for full details

CHANDLER TOOL COMPANY

MUNCIE, INDIANA

Chandler-Duplex

COMBINED BORING AND FACING TOOLHEADS

CIRCLE INFORM-A-GRAM KEY NO. 1402

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1403

LEAD HAMMERS—Buy Cook "SHUR-GRIP"

COMPLETE LEAD HAMMER SERVICE

They're a MUST in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

Write for circular and prices

LAWRENCE H. COOK, INC.

68 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1404

PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

US

UNITED STATES DIAMOND WHEEL CO.

1833 ILLINOIS AVE. AURORA, ILL.

IMMEDIATE DELIVERY on all wheel sizes. STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRCLE INFORM-A-GRAM KEY NO. 1405

ELIMINATE YOUR PROBLEMS!

COMPLETE DESIGN-AND-BUILD SERVICE.

• Tools, dies, jigs, gages, fixtures or special machinery. We'll work from idea, blueprint or sample part. Complete engineering service, experienced machinists. Prompt quotations.

Also METAL PRODUCTION CAPACITY

• For long or short production runs of large or small parts. Complete facilities including Profilometer Duplicators, Presses up to 450 tons, Planers up to 20 ft. stroke, Radial Drill Presses up to 8 ft., Lathes up to 158" c. c., Boring Mills up to 120" bed, Milling Machines, Grinders, etc.

Inquiries invited on individual or contract basis.

PIVOT PUNCH & DIE CORPORATION

North Tonawanda, N. Y. Phone JA 1200

CIRCLE INFORM-A-GRAM KEY NO. 1406

Expanding Mandrels

Accuracy 001" - No Distortion

No Slipping - Everlasting

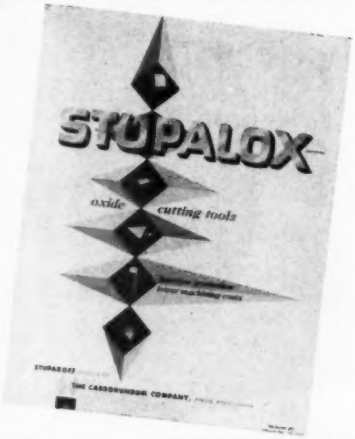
K.O.LEE CO.

ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 1407

Increase Production and Lower Machining Costs with Stupalox oxide cutting tools. A new line of "throwaway type" mechanical toolholders is introduced in a recently issued catalog. Also included is an expanded range of throwaway insert



sizes, slug-type inserts, and unground blanks suitable for either mechanical holding or epoxy-resin cementing to a steel shank. Contact The Carborundum Co., Stupakoff Div'n, Latrobe, Pa., for copies of Stupalox Oxide Cutting Tool Catalog 257, or — **Circle Inform-A-Gram No. B20.**

Chairs and Stools are highlighted in a catalog from Dependable Mfg. Co., 2407 Fort Crook Rd., Bellevue, Neb. This equipment is designed to save production and increase efficiency with correct height seating. Each model is shown and described, and the features and specifications listed. Get copies of the catalog from the company, or — **Circle Inform-A-Gram No. B21.**

A Multiple Unit Muffle Furnace is featured in Bulletin LAB-849 prepared by Hevi-Duty Electric Co., Milwaukee 1. It can be used for drying of precipitates, ash determinations, fusions, heating metals and alloys, heat treating, enameling, and for general experimental test work. The furnace can be used continuously at temperatures to 1850°F. Further details on the furnace are found in a bulletin supplied by the company, or—**Circle Inform-A-Gram No. B22.**

Equipment and Services now available at The Chicago Screw Company, 2701 Washington Blvd., Bellwood, Ill., are described in a new eight-page brochure. Covered are more than 1700 machines and many specialized metallurgical, engineering, and heat-treating facilities for screw machine work, hot or cold upsetting, and many secondary operations. Product design and final assembly are also discussed. Obtain copies of the brochure from the company, or — **Circle Inform-A-Gram No. B23.**

Rockwell 014 Low-Pressure Balanced Valve Regulators are described in a 12-page revised bulletin. Included in the bulletin are schematic drawings, dimensions, specifications, and capacities. In addition, the features are detailed and a diaphragm load chart and a method for computing capacity presented. Copies of Bulletin 1082 Rev. 2 are supplied by Rockwell Mfg. Co., Meter and Valve Div'n, 400 N. Lexington Ave., Pittsburgh 8, or — **Circle Inform-A-Gram No. B24.**

The TG-12 Centerless Grinder is featured in a brochure from Royal Master, Inc., State Hwy. 23, Riverdale 1, N. J. This machine grinds a wide range of materials, including plastics, tungsten carbide, and hard rubber. The illustrated brochure details the mechanical features of the grinder and shows the various types of grinds that can be performed. In addition, a complete specifications table giving data on capacity, equipment, and accessories is included. **Circle Inform-A-Gram No. B25.**

Recent changes and additions provide many bonus features.

Unobstructed perimeter (work from any side!)

Six Wheel Models

Capacities to 5,000 pounds.

LIFT LOWER TRANSPORT with PORTELVATOR®

The Handy HAMILTON Portable, Elevating Table

3 table surfaces 4 point support

Four Wheel Models

Special Designs too!

More Service for Less Money than Any other unit of equipment

A portable, height adjustable, steel table-truck-work bench! Used for die transfer, machine feeding, assembly (at *best* height, in *best* light). For lifting, lowering, transport of all compact, heavy loads. Saves "handling" accidents to both men and materials. Saves minutes for men wherever used.

Write* for NEW, FREE Bulletin No. P-2408

*ADDRESS

IT'S A Hamilton Tool USE IT WITH CONFIDENCE 2408

THE HAMILTON TOOL COMPANY
832 South Ninth Street
HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 141

Nicrobraz Brazing Rings for stainless and high alloy steel tube assembly work are described in an illustrated engineering data sheet. Covered are the features and advantages of the rings and their application. Available alloy grades for the full range are indicated and their characteristics and physical properties outlined. Wall Colmonoy Corp., Stainless Processing Div'n, 19345 John R, Detroit 3, will issue copies of Engineering Data Sheet 19, or — **Circle Inform-A-Gram No. B26.**

Details on a Duplex Continuous Slotting and Milling Machine are given in a four-page bulletin. Each of the two conveyors on the machine can be tooled separately so that two parts can be operated at the same time. The bulletin shows typical parts that can be performed on the machine, notes the features, and lists specifications. For your copy of the bulletin, write to The Pellow Machine Co., 13500 Foley Ave., Detroit 27, or — **Circle Inform-A-Gram No. B27.**

Increased output from your carbide or ceramic cutting tools

HYPREZ

OSCILLATING LAPPING MACHINE

Records prove that the Hyprez lapping technique increases tool output per grind 200% to 700% — improves speed and feeds 50% to 400% — assures finer finishes and closer tolerances on end products. Now, your carbide and ceramic cutting tools and inserts can be lapped or refinished precisely and quickly.

OSCILLATING WHEELS ASSURE PRECISION

The Hyprez Finisher moves the variable-stroke lapping wheel across the edge of the tool while it is held stationary in a precisely controlled position. Protractors set exact angles for the horizontal and vertical planes; edges are straight; the geometry is not distorted. The top, lands and radii of the tool can be finished to 1 micro inch in two minutes or less.

HYPREZ DIAMOND COMPOUNDS

Charged with proper grades of Hyprez Diamond Compounds, the oscillating lapping wheels produce uniform, predictable finish—faster, scratch-free, precise.

For a demonstration or complete literature write Dept. ST-77

HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. DEARBORN ST., CHICAGO 5, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 142

A Carbide Tool Catalog and Metalworking Guide has been released by Elgin National Watch Co., Abrasives Div'n, Elgin, Ill. It contains information on the complete line of Golden Circle carbide rotary tools. The

new line of electro-ground end mills is highlighted. In addition, operating suggestions covering end mill, reamer drill, and bur speeds and recommended feeds are given. Copies of the catalog are supplied by the company, or — **Circle Inform-A-Gram No. B28.**

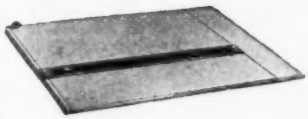
The Nicrobraz Family of High Temperature Brazing Alloys is discussed in Catalog SD-23 issued by Wall Colmonoy Corp., Stainless Processing Div'n, 19345 John R, Detroit 3. Covered are the characteristics and physical properties of the alloys, complete with charts showing performance curves. Also presented in the catalog are typical applications. Copies of the catalog can be obtained from the company, or — **Circle Inform-A-Gram No. B29.**

Design Features and Specifications of two contour attachments for turret lathes are presented in an eight-page illustrated bulletin. One is a cross slide mounted turning and facing unit for 2A, 3A, 4A, and No. 5 turret lathes, and the other, a hex turret mounted boring unit for 3A and 4A machines. Included in the bulletin are capacity dimensions and diagrams for each size machine. Copies of Bulletin 5702 are made available by The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, or — **Circle Inform-A-Gram No. B30.**

The Entire Line of Criterion Tool Products is illustrated and priced in a new 28-page catalog. Included are boring heads, both high speed and carbide boring; threading and grooving tools; cut-off tools with high speed or carbide blades; and other machine tool accessories. Criterion Machine Works, Costa Mesa, Calif., will provide copies of Catalog 7, or — **Circle Inform-A-Gram No. B31.**

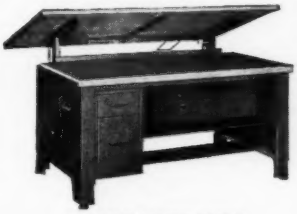
MAYLINE

These fine MAYLINE straightedges fit all tables!



Mayline straightedges can be had in under-the-board and table top styles of parallel ruling. Ask for folder S-15.

Produced in 4 styles:
Regal
Ideal
E-Z Grip
Mobile



MAY-O-MATIC TABLE

STEEL 4-POST TABLE

MAYLINE CO., Inc.
635 No. Commerce St.
Sheboygan, Wisconsin

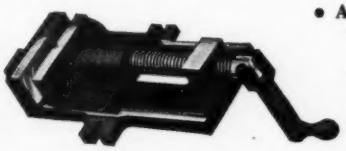
MAYLINE

CIRCLE INFORM-A-GRAM KEY NO. 1431

NEED A VISE? Check YOST First!

Write today for bulletin on the extensive Yost line.

Here is the **YOST** DRILL PRESS VISE —



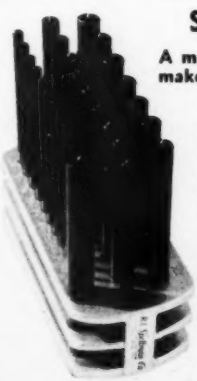
- **Available in two sizes:**

No.	Jaw Width	Max. Opening
1D	3½"	4"
2D	5"	5½"

- **Does away with special and costly jig fixtures.**
- **Developed expressly for use on drill press operations.**

YOST MFG. CO. 124 Grant St., Cambridge Springs, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1432



SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

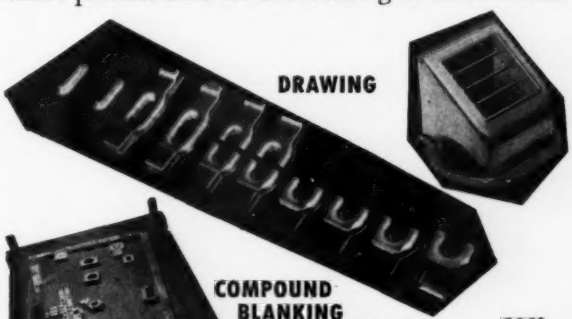
R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1433

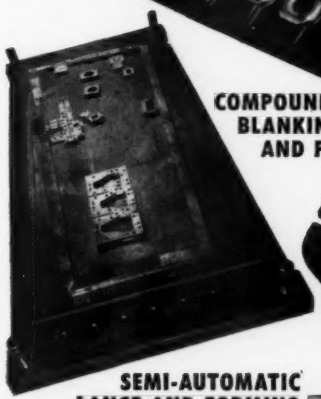
CUSTOM DIES by WHISTLER

EXPERIENCE
STAFF
CAPACITY

For nearly half a century S. B. Whistler & Sons, Inc. have been manufacturing custom dies for the top names in industry. With our large staff of experienced engineers and skilled tool and die makers, supported by extensive mechanical facilities, we offer a dependable die making service to any manufacturer whose product calls for the working of sheet metals.

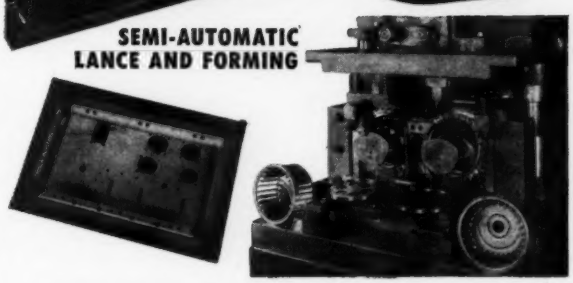


DRAWING



COMPOUND BLANKING AND PIERCING

CAM PIERCING



SEMI-AUTOMATIC LANCE AND FORMING

You are invited to send us your specifications and drawings for cost estimates and delivery schedule. See for yourself how Whistler dies are stepping up production and cutting costs in plants coast to coast.

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N. Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

CIRCLE INFORM-A-GRAM KEY NO. 1434

H○LES

JIG GROUND with

Vulcanaire

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.

A five station indexing fixture from Vulcan's Contract Tool Room (Your tool room in Dayton).

Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

{ Borrow our instructive 11 minute movie on Jig Grinding. }

Services of your Tool Room in Dayton

Engineering . . Processing . . Building . . Special Machines . . Vulcanaire Jig Grinders . . Motorized Rotary Tables . . Brehm Shimmy and related dies.

Vulcan's 41st Year

VULCAN TOOL COMPANY
741 Lorain Ave., Dayton 10, Ohio

VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 1441

Prompt Service on RAYMOND Chrome Vanadium

DIE SPRINGS

STOCK OR SPECIAL SIZES

MEDIUM, MEDIUM-HEAVY, HEAVY DUTY

Distributed by leading die set manufacturers

Wide variety of hole and rod sizes, lengths and deflections. Increased fatigue life. Reduced down time. *Write for specifications and price list, and name of nearest distributor.*

RAYMOND Manufacturing Co.

DIVISION OF ASSOCIATED SPRING CORPORATION

DEPT. TP-1 CORRY, PENNA.

CIRCLE INFORM-A-GRAM KEY NO. 1442

You can't go wrong

in buying Granite Surface Plates

if you follow these rules . . .

1. Be sure that surface plates are TRUE QUARTZ GRANITE, which is unequalled for surface plate performance. (In some cases, black diabase is being classified as "granite").
2. Look for *clearly defined accuracy.* Get a full explanation as to maker's method of expressing flatness.
3. Investigate for *wear resistance* properties.
4. Don't be misled by claims pertaining to such irrelevant factors as "high compressive strength". (The truth is that all granites possess far more compressive strength than is ever needed for surface plate use).
5. As in everything else, be guided by the reputation of the manufacturer.

We invite you to apply this check-list against Bryant Rock-of-Ages "TRUE" Granite Surface Plates. You'll find that these surface plates are the finest in every respect. This is because Bryant Rock-of-Ages Surface Plates, made of premium granite from the world's largest quarries, are finished *on the head of the grain;* and because their accuracy and satisfactory performance are guaranteed by two of the leading names in American industry. Write today for free folder.

BRYANT GAGE & SPINDLE DIVISION
Box 620H Springfield, Vermont

DIVISION OF BRYANT CHUCKING GRINDER CO.

Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers

CIRCLE INFORM-A-GRAM KEY NO. 1443

Over 7,000 Stainless Steel Fastenings are included in Catalog 56-A issued by Star Stainless Screw Co., 655 Union Blvd., Paterson 2, N. J. The catalog illustrates and describes these items and lists many new sizes, types, and products. Also given are

short cuts in ordering, the replacement of specials with standards, the difference between thread types, corrosion resistance tables, standard specifications for various types of stainless steel, and AN specifications. Copies of the catalog are made available by the company, or —
Circle Inform-A-Gram No. B32.

Drive Screws Rapidly from Any Angle with a completely automatic portable screwdriver. The Semspak, a self feeding, rapid-fire power screwdriver with visible-load cartridge, holds the screw tight until firmly started in the workpiece. For further details, see the folder issued by Illinois Tool Works, Shakeproof Div'n, St. Charles Rd., Elgin, Ill., or —**Circle Inform-A-Gram No. B33.**

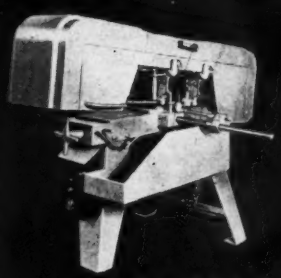
New Screw Machine Tools are now available for Brown & Sharpe No. 2 automatic screw machine. These tools have increased capacity and quick-setting features. A bulletin describes the tools in detail, giving listings, capacities, and dimensional data. For complete details, obtain a copy of Bulletin S25 from Brown & Sharpe Mfg. Co., Providence, R. I., or—**Circle Inform-A-Gram No. B34.**

A Stock Catalog of Small Metal Parts has been prepared by Zierick Mfg. Corp., Beechwood Ave., New Rochelle, N. Y. The standard parts shown are grouped according to most common use. A Designer's Sketchbook section presents the standard parts with thumbnail detail drawings. Also included are drawings of special parts designed to specification for unusual applications. Get your copy of Catalog 21 from the company, or —
Circle Inform-A-Gram No. B35.

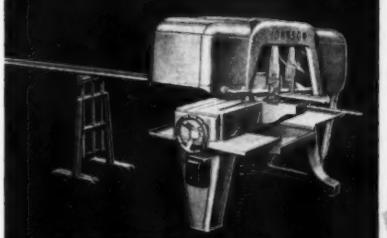
Fast, Easy Selection of the Right Fitting for Every Requirement is possible using a catalog of lubrication fittings from Stewart-Warner Corp., Alemite Div'n, 1826 Diversey Pkwy., Chicago 14. All fittings contained in the catalog are complete with individual dimensions. In addition, the catalog lists accessories, complete with specifications, dimensions, and applications. For copies of Catalog 38-23, contact the company, or —
Circle Inform-A-Gram No. B36.

Special Automatic Assembly Machines are described and illustrated in a new brochure. Also presented are assembly pictures and case histories, along with suggestions for taking the best advantage of automatic assembly operations. In addition, facilities for the design and construction of automatic assembly machines are detailed. For your copy of the brochure, write to Omer E. Robbins Co., 24800 Plymouth Rd., Detroit 39, or —
Circle Inform-A-Gram No. B37.

Model J (Heavy-Duty) Wet or Dry models. Easily handles 10" rounds, 18" flats.



Model B (Wet or Dry) For precise cut-off of 5" rounds, 10" flats.



Adjustable Stock Stand, provides rigid work support to speed production. Adjusts safely under heavy load.

TRIPLE THREAT...

TO HIGH METAL CUTTING COSTS

Johnson

METAL CUTTING BAND SAWS

FAST • TOUGH • ACCURATE

If you've got a tough cutting problem in your plant, a Johnson Saw is your best bet to solve it. Controls are centralized, easy to reach. Set up is simple. Operation is automatic, and speed control variable. See for yourself how a Johnson Saw will save time . . . labor . . . and dollars in your own plant.

JOHNSON MANUFACTURING CORP.
1015 BARNES ST.
ALBION, MICHIGAN

• • • • • WRITE TODAY
for Your copy of the big, illustrated Johnson Saw catalog. It's yours for the asking!

Eastern Distributor
R. J. R. KELLY CO.
Hale Bldg., 51 Main St.
East Orange, N. J.

Mid-Western Distributor
W. Q. LUNDMARK
75 N. Broadway
Des Plaines, Illinois

Western Distributor
HASTINGS DISTRIBUTORS
1605 Solano Avenue
Berkeley, California

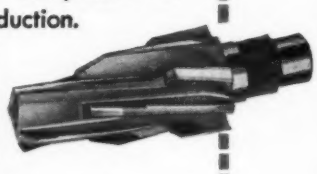
CIRCLE INFORM-A-GRAM KEY NO. 145

Faster, Heavier, and More Accurate Cutting and Shaping of Metal is performed by Burdox cutting machines. They will produce an unlimited range of shapes from plate, slabs, or billets in thicknesses up to 12" using as many as eight torches simultaneously. A brochure details the features of these machines, complete with accessories. Copies of the brochure are made available by The Burdett Oxygen Co., 3300 Lakeside Ave., Cleveland 14, or —
Circle Inform-A-Gram No. B38.

Precision Economy Diamond Tools are featured in Catalog 4-57 announced by Precision Diamond Tool Co., Box 274, Elgin, Ill. The diamond tools listed are throw-away type dressers that do not require any resetting. Included in the catalog is a description of a steel matrix which holds small, enlongated diamonds until they are completely used. The line of tools is made in single point dressers, multiple type, and disc type, available from stock.
Circle Inform-A-Gram No. B39.

FINE CUTTING TOOLS by Eclipse

Since 1913 Eclipse has been consistently and conscientiously serving many companies in widely diversified fields of production. Each of these companies has found that "Engineered by Eclipse" is assurance of genuine quality in end cutting tools.



- High Speed Steel Cutters
- Carbide Tipped Cutters
- Core Drills
- Inserted Blade Cutters
- Multi-Diameters
- Back Spotfacers

and remember . . .

Eclipse now has a complete line of Precision End Mills. Ground from the solid, Eclipse End Mills insure longer tool life, finer finishes and lower production costs.

- Write for Counterbore Cat. No. 51
- Write for End Mill Cat. No. 56

ECLIPSE COUNTERBORE COMPANY
DETROIT 20, MICHIGAN
END MILL DIVISION—NORTH BRANCH, N. J. (ADDRESS BOX 87, RARITAN N. J.)

CIRCLE INFORM-A-GRAM KEY NO. 146

Save Time in Selecting Drills by using completely new Drill Catalog 825 announced by Besly-Welles Corp., S. Beloit, Ill. It contains details on a complete line of drills and includes end mills, reamers, tool bits,

and other related tools. Tables present information on high speed, carbide tipped, and solid carbide tools, giving size, overall and flute length, and prices. Two sections are devoted to automotive and aircraft drills.
Circle Inform-A-Gram No. B40.

Increase Capacity, Simplify Setup, and Cut Costs with the Goodrich hydraulic duplicator. It simplifies the shaping of contours and locks from templates or models. The duplicator can be adapted to many makes and models of die room equipment. For details and typical applications, get a bulletin from Metal Machining Co., 617 May St., Lansing, Mich., or —
Circle Inform-A-Gram No. B41.

Ideal for Short Production Runs in metal forming, straightening, coining, forging, light hobbing, and for general testing and die tryout is the Watson-Stillman 150-ton general-purpose press. A bulletin contains illustrations of the press and points out its features. Also listed are the specifications. For complete information on the 150-ton press, see Bulletin 371 released by Farrel-Birmingham Co., Inc., Watson-Stillman Press Div'n, 109 Aldene Rd., Roselle, N. J., or —
Circle Inform-A-Gram No. B42.

Three Separate Lines of Single Point Lathe Tools are listed in Catalog 571 released by The Viking Tool Co., 1000 Nichols Rd., P.O. Box 471, Shelton, Conn. Two sections cover single point tooling using throwaway inserts. The third section describes extra heavy duty regrindable insert tools. Engineering specials are also noted. In addition, a carbide comparison chart is included. Obtain copies of the catalog from the firm, or—**Circle Inform-A-Gram No. B43.**

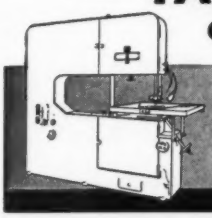
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

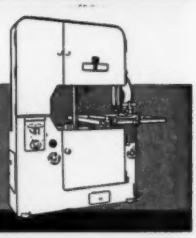
THE TANNEWITZ WORKS

GRAND RAPIDS, MICHIGAN ☎ **GL-6-1729**



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES for CONTOUR SAWING, FILING, POLISHING

The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1471

Conversion to NYLON-GEAR BY SMALL-LOT MOLDING PROCESS

ACTUAL SIZE ACTUAL SIZE

SAVES 26¢ PER UNIT

This Zytel 101 Nylon Beveled Gear replaced a machined gear that formerly cost 59¢ each. After the initial tooling costs we die-molded it in one operation by our special injection process at 33¢ each.

COST ANALYSIS:

Tooling, set-up and first 100 pieces, including material and trimming **$286.00**

Additional 100 lots: $33.00

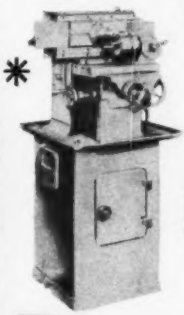
In addition to a cheaper piece price and equal wearing qualities, the Nylon Gear proved rustproof, noiseless, required no oiling and weighed less.

Let us quote on your Short-Run Plastic Moldings. We will gladly submit quotations without obligation.

DAYTON ROGERS *Manufacturing Company*

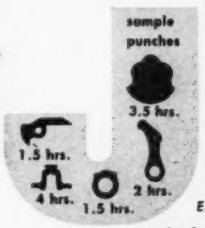
MINNEAPOLIS 7B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 1472



FORM and PUNCH SHAPER

ECONOMICAL PUNCHES with CURVED NECKS finished completely IN ONE CHUCKING



with the

JEMCO K-150

punch shaper

- finish job in one chucking
- 30 power built-in microscope for high precision — close tolerances

EXCLUSIVE TERRITORIES OPEN

write for complete information to . . .

Jersey manufacturing company

401-B LIVINGSTON ST. • ELIZABETH, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1473

NOW GET CLEAN SURFACED PARTS FROM YOUR AUTOMATICS . . . UNMARRED BY TOOL WITHDRAWAL MARKS

THE NEW RELIEVOMATIC SELF-RELIEVING TOOL HOLDER

SAVES YOU COSTLY SECONDARY FINISHING OPERATIONS

Avoid scratches like this

All clear with "Relievomatic!"

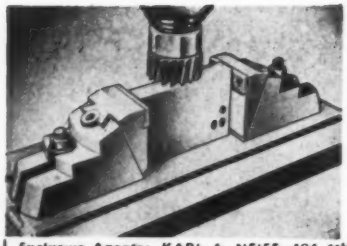
Easily installed on cross-slide or turret

Write today for details.

SILBER PRODUCTS, INC. WOrth 6-1133

134 Lafayette Street • New York 13, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1474



MASTER GRIPPING CLAWS

System Hubner

WHY use them?

1. Clamping action Vertical as well as Horizontal—pressing workpiece down directly on the machine table. No hammering. No air between.
2. Gain more working room.
3. Faster and more secure setups. Easier to handle.
4. Unlimited jaw opening.
5. No straps overlapping on the workpiece; more machining surface.
6. Extremely versatile—take light cuts or heavy cuts, use on small machines or heaviest production machines.

NEISE MODERN TOOLS

Exclusive Agents: KARL A. NEISE, 404 4th Ave., N. Y. 16, N. Y., Dept. TP

CIRCLE INFORM-A-GRAM KEY NO. 1481

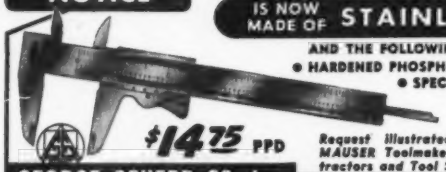
IMPORTANT NOTICE

The Genuine MAUSER VERNIER CALIPER

IS NOW MADE OF STAINLESS STEEL THROUGHOUT

AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED

- HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
- SPECIALLY LONG VERNIER to read thousandths
- 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back



$14.75 PPD

Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Stands.

GEORGE SCHERR CO., Inc.

200-T Lafayette Street • New York 12, New York

CIRCLE INFORM-A-GRAM KEY NO. 1482

Illustrated—New 9700 Series Piggy Back Hydraulic Control Valve Meets J.I.C. Standards

Look to Logan

the ultimate in hydraulic valve design

FREE SEND FOR THE "LOGAN CALCULATOR"

MEMBER: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.

LOGANSPORT MACHINE CO., INC.
844 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
- ☐ 100-2 MILL-TYPE AIR CYLS.
- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
- ☐ 100-5-1 ULTRAMATION CYLINDERS
- ☐ 51 PRESSES
- ☐ FACTS OF LIFE
- ☐ 62 SURE-FLOW PUMPS
- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 and 200-7 HYD. VALVES
- ☐ 200-6 SUPER-MATIC CYLS.
- ☐ 70-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

TO:

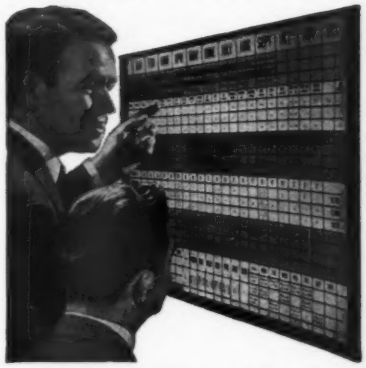
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CIRCLE INFORM-A-GRAM KEY NO. 1483

You Get Things Done With Boardmaster Visual Control



- ☆ Gives Graphic Picture of Your Operations—Spotlighted by Color
- ☆ Facts at a glance — Saves Time, Saves Money, Prevents Errors
- ☆ Simple to operate — Type or Write on Cards, Snap in Grooves
- ☆ Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
- ☆ Made of Metal. Compact and Attractive. Over 150,000 in Use

Complete price $49.50 including cards

FREE 24-PAGE BOOKLET NO. Z-100 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS

55 West 42nd Street • New York 36, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1484

---

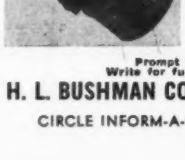
100 USES

PRODUCTO SELF-CENTERING SHAFT VISE

This versatile vise has a hundred uses in your shop. Made for vertical or horizontal mounting, it's ideal for holding shafts or spindles 3/8" to 3 1/8" dia. when machining keyways, slots, splines. Design insures accurate radial cuts. Write for detailed bulletin.

THE PRODUCTO MACHINE CO.
970 Housatonic Avenue
Bridgeport 1, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 1485



LIFTING DEVICES

for

FAST • SAFE • BETTER Material Handling of

- SHEETS
- COILS • BOXES
- MOLDS
- DRUMS • PALLETS

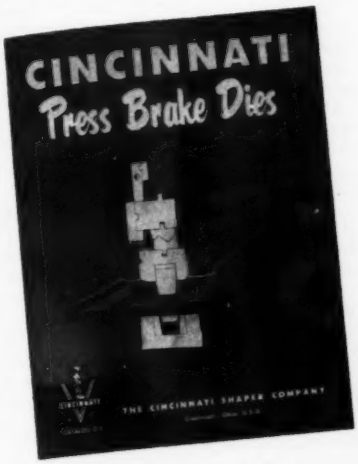
400 MODELS

Prompt Delivery
Write for full particulars

H. L. BUSHMAN CO. 100 West Central Ave. Roselle, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1486

Dies for Forming of a Variety of Products are designed and manufactured by The Cincinnati Shaper Co., Cincinnati, O. A catalog has been issued to assist in visualizing forming methods for particular products.



Stock finished dies are not listed. Instead, one section is devoted to listing sizes of the company's stock of brake die steel. Direct requests for copies of Catalog D-2 to the company, or—**Circle Inform-A-Gram No. B44.**

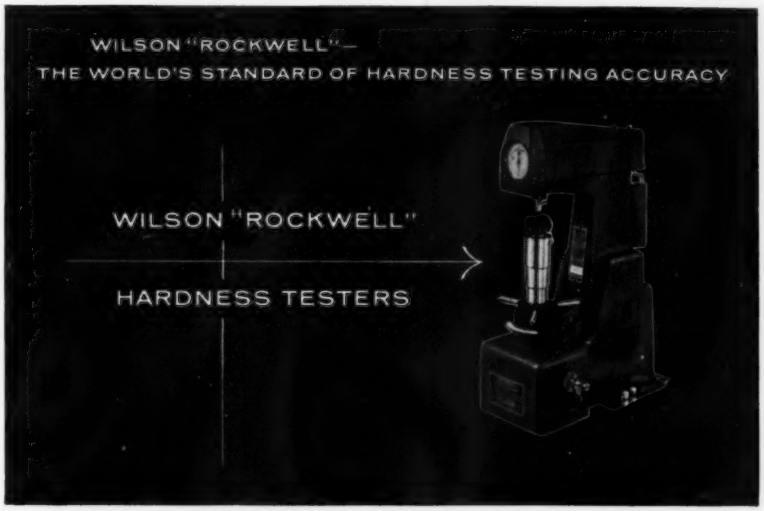
Republic Electro Paintlok is zinc-plated steel sheet that is chemically treated to take paints, lacquers, synthetics, and enamels, and hold them. A bulletin gives tips on welding, soldering, cleaning, painting, and fabrication; and shows typical product applications. In addition, it details the advantages of Electro Paintlok sheets. All the facts are found in Booklet Adv. 655-R from Republic Steel Corp., Advt. Div'n, 3100 E. 45th St., Cleveland 27, or —
Circle Inform-A-Gram No. B45.

Filters, Regulators, and Lubricators are detailed in Folder F-15B published by Watts Regulator Co., Industrial Div'n, Lawrence, Mass. Each of these pneumatic specialties is shown, described, and the sizes and specifications noted. Also covered are air relief valves and strainers. One section is devoted to accessories. For your copy of the folder, write to the company, or —
Circle Inform-A-Gram No. B46.

Up To 200% Greater Output of Machined Parts is possible using a leaded alloy steel. Rycut 40, a chromium-molybdenum .40 carbon alloy steel, features longer tool life, closer tolerance, and better finish. An engineering data bulletin includes case studies, mechanical properties, and an eight-point quality control plan. Direct requests for Bulletin 14-5 to Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, or —**Circle Inform-A-Gram No. B47.**

The Features of High-Speed Sensitive Tapping Attachments that run in oil are discussed in Bulletin 22A published by Ettco Tool & Machine Co., Inc., 594 Johnson Ave., Brooklyn 37. The bulletin outlines the construction, physical characteristics, and applications of the complete line of Ettco-Emrick tapping attachments that quickly fit on any drill press. Also listed are the available accessories for the tapper, which is produced in capacities from No. 0 to ¾". **Circle Inform-A-Gram No. B48.**

Designed to Hold Close Concentricity and to relieve distortion due to chucking pressure are Speedgrip Cyl-Chucks. This self-contained production tool is used where air or hydraulic actuating devices are not adaptable or available. Cyl-Chucks are available in two types — self-centering and compensating. Details on Speedgrip Cyl-Chucks are found in Bulletin 23 issued by Ernest, Holdeman & Collet, Inc., Speedgrip Chuck Div'n, Elkhart, Ind., or — **Circle Inform-A-Gram No. B49.**



A FULL WILSON LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

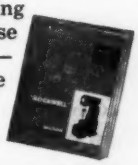
FULLY AUTOMATIC
•
SEMI-AUTOMATIC
•
SPECIAL
•
SUPERFICIAL
•
MICRO & MACRO HARDNESS TESTERS

For easy, accurate production tests

Sensitive and Accurate as a precision balance —the WILSON "Rockwell" hardness tester insures the quality of your products and protects your good name as a manufacturer.

Durable as a machine tool—WILSON "Rockwell" hardness testers withstand severe daily use with a minimum of service requirements.

A staff of WILSON hardness testing experts is available to help choose the model best suited to your job—and provide quick emergency service if it is ever needed.



Write for booklet DH-325 today

ACCO for Better Values

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

ACCO

230-TP Park Avenue, New York 17, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 149

The Operation and Advantages of Hi-Eff Balancing Machines are highlighted in an eight-page bulletin. Specifications, including balancing machine capacities and dimensional data, are given along with photos of typical workpieces that can be balanced on the equipment. Taylor Dynamometer & Machine Co., 6411 River Pky., Milwaukee 13, will make available copies of Bulletin SB-1 containing information on the balancing machines, or —
Circle Inform-A-Gram No. B50.

Lever Punches are the subject of Catalog 10 from W. A. Whitney Mfg. Co., 632 Race St., Rockford, Ill. Covered are hand, bench, and hydraulic punches; punches and dies; Whitney hammers; and the Chicago steel slitting shear. Also included in the catalog is the No. 606 angle iron shear, punch vise, and No. 108 conveyor. Each item is shown, the features listed, and the specifications given. Copies of the catalog are issued by the company, or —
Circle Inform-A-Gram No. B51.

After the heaviest cuts— they disengage with a twist of the wrist

Continental Counterbores are designed so that cutting torque produces compression rather than shearing stresses. This counterbore never binds—you get quick, easy disengagement after all cutting operations. Anti-wedging action saves time and tools.

For more information or literature on Continental Counterbores, call your local Ex-Cell-O Representative or write to Continental Tool Works in Detroit.

Continental TOOL WORKS
DIVISION OF
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

57-17

CIRCLE INFORM-A-GRAM KEY NO. 150

Electrolytic Shaping of Honeycomb Materials is detailed in a folder put out by Anocut Engineering Co., 631 W. Washington St., Chicago 6. This method eliminates the problem of burring and/or layover. Given are technical tips on using Anocut equipment, covering wheels, electrotype, and mounting of material. The bulletin also discusses the equipment needed, grinder conversion, contour cutting, and special installations.
Circle Inform-A-Gram No. B52.

Carbide Gages and Threading Tools are highlighted in Bulletin CT-56 prepared by Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Baseline, Mich. Included are specifications and prices for plain cylindrical and thread plug carbide gages. The advantages of specially-engineered carbide taps and thread milling cutters for threading abrasive materiels are also described. Get your copy of the bulletin from the company, or —
Circle Inform-A-Gram No. B53.

Electrolytic Oscillating Tool and Chip Breaker Grinders are featured in Bulletin 238 prepared by Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich. Model SCE-6 oscillating carbide tool grinder eliminates the effort and fatigue of manual tool oscillation and provides variable stroke length and frequency. Model CBE-10 electrolytic chip breaker grinder is used with 10" diamond wheels. In addition to describing the grinders, the bulletin details the advantages of electrolytic grinding.
Circle Inform-A-Gram No. B54.

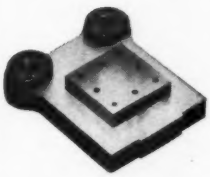
Series A, B, C, and L Chicago Press Brakes are featured in Catalog AL-57 from Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36. Illustrated and described are the principle construction features. Also listed are complete specifications for the different sizes of brakes in 30, 36, 50, and 60 ton capacities. In addition, information is given on Chicago induction hardened dies for all makes of press brakes.
Circle Inform-A-Gram No. B55.

A Double Housing Special Way Grinder is detailed in Bulletin HAT from The Hill Acme Co., 1201 W. 65th St., Cleveland 2. The illustrated bulletin shows various views of the grinder and discusses them, pointing out the machine's advantages. In addition, the specifications are listed. For complete details on the double housing special way grinder, obtain a copy of the bulletin from the company, or —
Circle Inform-A-Gram No. B56.

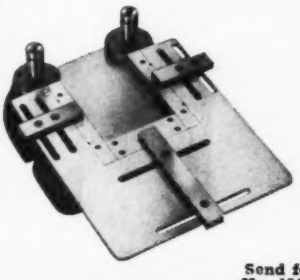
Punches and Dies

Notching Die with Gauge Table

Standard stock sizes 4", 5" and 6". Lick those Notching Problems QUICKLY. Gauge table and gauging bars provide accuracy and speed with easy adjustment.



This is another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Precision made from high grade tool steel. Also adaptors and die shoes to convert your press.



25th ANNIVERSARY

What are your punch and die needs? Consult us about your problems. Prompt service on "Specials" made to your order.

Send for free illustrated catalog No. 154 AF. Net prices shown.

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1511

Check Harmful Vibration At Its Source

UNISORB MACHINE MOUNTS

Unisorb reduces up to 85% of transmitted vibration — protects against unseen wear and tear. Also helps increase machine speeds, get better quality workmanship.

PLUS . . . these money-saving extras:

- Up to 30% cheaper installation costs, 80% time saving.
- No floor drilling, no bolts or lag screws.
- Firm anchoring, yet permits moving when required.

Permanent alignment, no machine "walking," precision shimming.

FREE Sample and Booklet . . .

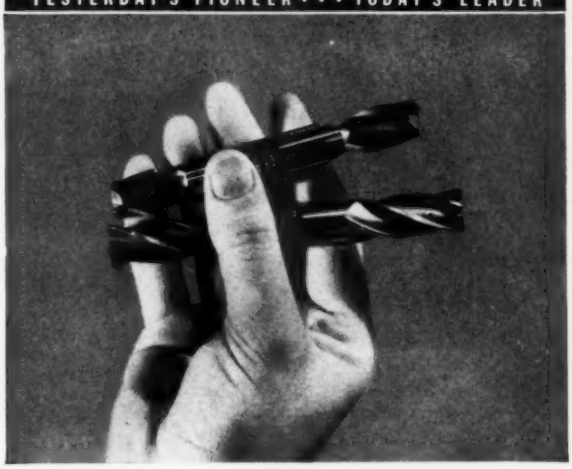
Tells how and why Unisorb will pay off for you. Mount just one of your machines and feel the difference. Send reader service card, call or write . . .

FE7-10

the **FELTERS** company
202 SOUTH ST., BOSTON 11, MASS.
Manufacturers of Felt and Felt Products
Representatives in principal cities throughout the world

CIRCLE INFORM-A-GRAM KEY NO. 1512

YESTERDAY'S PIONEER . . . TODAY'S LEADER



EXPERIENCE—
There is no substitute

40 years' successful experience as a company in the manufacture of cutting tools means that when you buy Weldon tools you are assured of the finest.

For all of these years we have consistently led the field in the origination and production of the highest quality end mills, holders and allied items.

Specialization for 40 years—that is the Weldon record—and the best of cutting tools is the result.

Weldon distributors throughout the U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

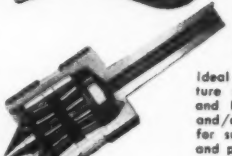
CIRCLE INFORM-A-GRAM KEY NO. 1513

IDEAL GOLD BAND

LIVE CENTERS

GUARANTEED TO MATCH OR EXCEED, "CRITICAL" JOB SPECIFICATIONS

In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to ± .0001") GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lathe output both in quantity and quality. Contact your distributor today...or



PRECISION FITTED BEARINGS

Ideal Live Centers feature precision machined and hardened ball and/or roller bearings for superior accuracy and performance. Sealed to keep dirt out, grease in.

A COMPLETE LINE FOR EVERY NEED...SPECIALS, TOO!

Send for

Complete catalog data and specifications.

IDEAL INDUSTRIES, Inc

334-G Park Ave., Sycamore, Ill.

DISTRIBUTED BY THE NATION'S LEADING INDUSTRIAL DISTRIBUTORS

CIRCLE INFORM-A-GRAM KEY NO. 1521

New!

ALINA SCROLL CHUCK

A truly high precision chuck developed to meet exacting requirements. The method of clamping the largest possible area of the circumference permits minimum use of pressure; fragile work is never deformed or crushed. In order to maintain this advantage chucks over 4" capacity are equipped with eight jaws.

Removable jaws are available in a wide variety of styles for internal or external chucking, or they may be had in blank form suitable for your own machining.

Simple design permits quick and easy replacement of the shank, and shanks to suit special requirements may be machined at minimum cost in any shop.

Six sizes from 2" to 6" to fit all machines. Furnished with or without shanks.

WRITE FOR LITERATURE AND COMPLETE CATALOG

ALINA CORPORATION

122 East Second St., Mineola, L.I., N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1522

your missing link

SPITFIRE

precision quality lapping machines

for every lapping requirement... both flat and cylindrical

Spitfire lapping fits into your production picture . . . learn how — today! Get full details.

illustrated: Spitfire Gyro-Matic "21" automatic flat lapping machine

SPITFIRE Tool Machine Co.

2931 N. Pulaski Rd., Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1523

"Noise Control" illustrates with charts and photos the applications of new pneumatic mufflers for the elimination of exhaust noises of air operated equipment. The charts show the performance data of the mufflers in frequency and attenuation levels in decibels; loudness and attenuation levels in sones; air flow cfm; noise levels; and attenuation levels at various airline pressures. Copies of the brochure can be obtained from Allied Witan Co., 12500 Bellaire Rd., Cleveland, or —
Circle Inform-A-Gram No. B57.

An 18-Page Condensation of the 1957 Mill Products Catalog has been published by Reynolds Metals Co., 2500 S. 3rd St., Louisville 1, Ky. The brochure is intended as a reference guide for preliminary discussion of design and fabrication considerations. Included are selection guides for wrought alloys in sheet, plate, and foil; wire rod and bar; tubing and pipe; extruded and structural shapes; and for casting alloys. Copies of the brochure, "1957 Reynolds Aluminum Mill Products," are made available by the company, or —
Circle Inform-A-Gram No. B58.

Permanent Form Control of Grinding Wheels using cutters of cemented diamond particles is discussed in the first of a series of progress reports. This new process permits complete automation of grinders and eliminates time out for wheel dressing. The report in the form of a six-page brochure contains schematic drawings to illustrate the principle involved, photos of cutters, and illustrations of actual installations. Koebel Diamond Tool Co., 9456 Grinnell, Detroit 13, will make available copies of Bulletin LO-5709, or —
Circle Inform-A-Gram No. B59.

Designed for Presses and Semi-Automatic or Automatic Machine Tools with built-in return oil arrangements is a new type of circulating oil system. This product monitors its own operation through a pressure sensing mechanism to warn of clogged or broken lines in any part of the system. The Lubrival is detailed in Bulletin 70 made available by The Farval Corp., 3249 E. 80th St., Cleveland 4, or —
Circle Inform-A-Gram No. B60.

Short Run Piercing of Component Parts for trucks and related equipment is performed by Wiedemann turret punch presses. Work is pierced to close tolerances at high speed without layout or setup. Complete details, specifications, features, and illustrations are found in Bulletin 600TR from Wiedemann Machine Co., 540 Wissahickon Ave., Philadelphia 32, or —
Circle Inform-A-Gram No. B61.

Hydraulic Power Units are detailed in a 52-page catalog recently published by Oil-Dyne, Inc., 2117G W. Marquette Rd., Chicago 36. Included are complete technical data and specifications on 2,240 different types and models of pumps, single and duplex pressure switches, hydraulic cylinders, and a full line of accessories. The hydraulic units are designed to develop maximum power output from a unit of minimum size and weight.
Circle Inform-A-Gram No. B62.

Mecco Safety Steel Stamps, Holders, Fixtures, and other marking devices are included in a new four-page bulletin. Each item is shown and described. These steel stamps feature freedom from spalling and mushrooming and greatly increased marking life. Featured are a series of charts and related data to facilitate ordering steel stamps. M. E. Cunningham Co., 1025 Chateau St., Pittsburgh 33, will supply copies of Bulletin SS-120, or —
Circle Inform-A-Gram No. B63.

new Di-Acro turret punch press*

Accurate Burr-Free Punching at 12 Rotating Stations

The new Di-Acro 4 Ton Turret Punch Press provides rapid, close tolerance punching of round, square, oval and rectangular holes from 1/16″ to 2″.

Rotating turrets provide rapid indexing for single or sequence punching. Precision hole location quickly obtained with Micro-twin gauges. Punches sheet metals up to 16 gauge mild steel, fibreboard, asbestos, paper, cork, leather, rubber, plastic and other sheet materials.

Dies are mounted in turrets—always handy. Standard clearance between punch and die is .002″. Choice of 6 other clearances at no charge. The Di-Acro Turret Punch Press is safe, simple to operate—requires little maintenance.

di-acro PRECISION METALWORKING MACHINES

Consult the Yellow Pages of your phone book for the name of your nearest Di-Acro distributor or write us for catalog describing this and other Di-Acro machines.

*pronounced die-ack-ro

O'NEIL-IRWIN MFG. CO.

315 8th Avenue • Lake City, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 153

The 7 Cu Ft Super Tumblast Machine is described in Catalog 132-D released by Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind. The machine is used for high-speed, low-cost cleaning of castings, forgings, weldments, heat treated parts, and other metal products. The catalog contains cutaway drawings to illustrate and describe each of the machine's new features. Also presented are complete construction details and mechanical specifications.
Circle Inform-A-Gram No. B64.

Recommended Use, Method of Application, and Properties of eight typical Ray-Bond adhesives are presented in tabular form in a four-page folder. Also covered in the folder are protective coatings and sealers. A graph shows the shear strength of five thermosetting adhesives in the temperature range from 100° to 650°F. Direct requests for copies of Bulletin 650A to Raybestos-Manhattan, Inc., Adhesives Dept., Bridgeport 2, Conn., or —
Circle Inform-A-Gram No. B65.

FOR THE TOOL ENGINEER
WHO NEEDS EVERYTHING
Plus FAST SERVICE!

3P PUNCHES & DIE BUTTONS
BAL-LOK* PUNCHES & DIE BUTTONS

Special Punches & Die Buttons**

No delay when ordering. Fast delivery service from more than 75,000 basic sizes in stock through Distributors in principal cities. 3P specializes in promptness, service.

3P Head Punches and Die Buttons, and Bal-Lok* Punches and Die Buttons are made of the finest quality tool steels. Both types are available in any DECIMAL size. No extra charge for high quality or ODD sizes. Bal-Lok* Punches are guaranteed interchangable in your present retainers.

"Still the best performer"

*Reg.
**Send Prints.
Prompt Quotations Assured

PORTER PRECISION PRODUCTS
PRinceton 1-6338 • P.O.Box 208 • Cincinnati 15, Ohio

Automatic Table Cycles are a feature of the new Cincinnati No. 2 size milling machines for production, general purpose, and toolroom work. This feature is controlled by dogs mounted in T-slots at the front of the table. A folder discusses the machines' features and presents typical automatic table cycles. Obtain copies of the folder from The Cincinnati Milling Machine Co., Cincinnati 9, O., or —
Circle Inform-A-Gram No. B66.

Diamond Compounds are the subject of Bulletin 101, a price list, offered by The Amplex Corp., 968 Farmington Ave., W. Hartford, Conn. Listed are grades from ½ to 170 micron range in a variety of concentrations and WC diamond compound for finishing tungsten carbide, heavy concentration only. Copies of the price list are supplied by the company, or —
Circle Inform-A-Gram No. B67.

Indexing Machine Components are highlighted in a data sheet set from Hartford Special Machinery Co., Hartford, Conn. Presented are specifications on standard components for the 65" horizontal indexing machine. The data sheet illustrates the self-contained components, which are engineered for quick assembly into complete low-cost, high production automatic machines suitable for many varied operations.
Circle Inform-A-Gram No. B68.

Flar-A-Lock Template Drill Bushings for metal, masonite, or plastic tooling are featured in Catalog 102A from Techno Products Corp., 143 Netherwood Dr., Springfield, Pa. These bushings, which retain perfect alignment during long production runs, are easy to install and remove without template damage or distortion. The catalog points out design features and tells how the bushing works. In addition, the various models available are illustrated and described, and the specifications listed.
Circle Inform-A-Gram No. B69.

The Uses and Properties of an Electrolytic Iron are described in a new bulletin. Vanderloy is used to reclaim worn machine parts and mismachined parts, provide a magnetic surface on non-magnetic metals, and protect soft or perishable metals and alloys. It is also used to electroform molds and dies, reinforce fragile metal forms, and provide a surface with a high affinity for tinning. Copies of the bulletin, "Vanderloy, The Electrolytic Iron," are available from Van der Horst Corp., Olean, N. Y., or —
Circle Inform-A-Gram No. B70.

AIR-MITE

HIGH PRODUCTION AIR PRESS
with more Quality Features

★ Solid Steel Column. Greater strength and rigidity.
★ Brass cylinder, aluminum end castings, Hy-Car piston cups.
★ Accurately ground table.
★ Fast set-up and stroke adjustment.

You don't have to "baby" an AIR-MITE Press because they're ruggedly built to stand the gaff of production work. From the tip of their solid steel column to the heavy base, they're every inch a workhorse tool. Feature-for-feature, you can't buy a better, more economical operating press than an AIR-MITE.

Special adaptations available. Write us your needs.

1 Ton Capacity
$89.95
F. O. B. Chicago

New 3 Way Control Valve. For safer, more efficient press work, use AIR-MITE Control Valves. Connected in parallel and positioned on either side of an air press, they provide a safe, instantaneous press operating control. Operator must depress both handles to actuate press . . . keeps attention on work-piece, hands out of the way. For pressures up to 160 p.s.i.

AIR-MITE Devices, Inc.
4405A W. KINZIE • CHICAGO, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1551

✓✓✓ Check these *3 Comet* 'TIPS' for Precision Boring, Facing and Internal Threading

Made of
HIGH SPEED or CARBIDE
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

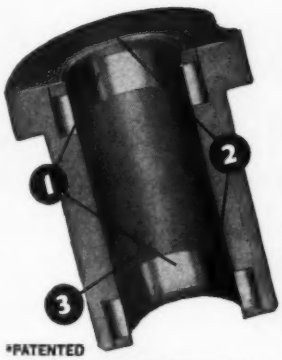
* CONSTANT SHAPE & CLEARANCE
* FAST PERFORMANCE
* ECONOMY IN PRODUCTION
* EFFICIENT IN RESULTS
* EASY RESHARPENING
* CONVENIENT TO USE
* LONG LIFE
* INDISPENSABLE FOR PRECISION BORING OF SMALL HOLES

COMET offers
"SOLID CARBIDE INSERT" BORING TOOLS
Made to Your Specifications

COMET Tool Co.
738-1 BROADWAY • NEW YORK 3, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1553

INCREASE PRODUCTION.. SAVE TIME & MONEY



*PATENTED
1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for MEYCO Bushing Catalog No. 41

MEYCO
Carbide Inserted Bushings Are Doing It Daily!

How? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that approach the price of steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

ESTABLISHED 1888
W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1552

FREE... 64 PAGE CATALOG

WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
write for your copy—TODAY!

JERGENS TOOL SPECIALTY CO.
Dept. TP-7 712 E. 163rd St., Cleveland 10, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1554

HOLD IT!

FIRMLY BUT GENTLY

WITH WOODWORTH CHUCKING EQUIPMENT

Our tough looking character who is holding the smiling baby clearly demonstrates one fact: whenever you are holding *anything* it should be secured with gentle firmness. And this is so true when considering chucking equipment.

Your best machine will produce only as accurately as its work-holding device permits and Woodworth manufactures the most rugged, accurate and dependable chucks for precision machining in America.

We invite your inspection and consideration of N. A. Woodworth products. There is a Woodworth Sales Representative in your area and a letter to the N. A. Woodworth Company will place him promptly at your service.

"Accuracy you can trust"

WOODWORTH
1300 East Nine Mile Road
Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1561

L W POWER HACK SAWS

For Speed and Efficiency

● Gravity feed ● 6" x 6" capacity using 10" x 14" blades ● Swivel vise for angle cuts ● Stops automatically on completion of cut. ● Automatic relief of blade on non-cutting stroke ● 12" x 3" clutch pulley speed 120 r.p.m. ● Expanding clutch ● Coolant pump base ● All-steel welded base and table ● Rigid frame ● V-belt drive ● Length gauge.

$385.00

3-speed (90-130 r.p.m.) motor drive arrangement with V-belts and pulleys but less motor, $45.00. ½ H.P. 1725 r.p.m. motor recommended. Completely motorized with motor and starter: Single phase $485.00. Three phase $493.75.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 72 SO. ST. CLAIR ST. TOLEDO 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1562

STAMPINGS - - - SHORT RUNS

A dependable service for small quantity requirements for new developments and production up to 50,000 pieces. QUICK DELIVERY — ACCURACY — backed by 25 years' experience.

SMALL LOT STAMPING CO.

HUnter 6-3700 — Dedicated to Short Runs" — 1025 W. Blancke St. Linden, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 1563

Small Welding Positioners from 75 to 500 lbs are featured in a new eight-page bulletin. Included are Models B75, B200, AW300, BT50, BT5001CB, and BT50HS. They are shown with applications, schematic drawings, and complete specifications. Also included in the bulletin are optional accessories. For your copy of Bulletin SU57, contact Aronson Machine Co., Arcade, N. Y., or —
Circle Inform-A-Gram No. B71.

Stace Precision Air Chucks are featured in a bulletin from Crodian & Co., 4897 Kesler Blvd., East Dr., Indianapolis 20. These chucks improve the performance of machines, increase accuracy, cut rejects, and reduce costs. The bulletin gives details on the chucks, complete with illustrations and diagrams. Also given are specifications. Get copies of the bulletin from the company, or —
Circle Inform-A-Gram No. B72.

"Promat's Progress," a new controlled-circulation magazine, is being issued monthly by Poor & Co., Promat Div'n, 851 S. Market St., Waukegan, Ill. It is sent to persons in the metal finishing field interested in the hot-dip, electro-plating, and electro-galvanization processes. Copies can be obtained from the company, or —
Circle Inform-A-Gram No. B73.

Liquid Coolant Chillers for industrial applications are the subject of a bulletin issued by Lundholm Mfg. Co., 1121 Charles St., Rockford, Ill. They are fully automatic, compact, self-contained, and dual controlled. The bulletin describes and illustrates the chillers and shows typical uses for them. Complete information is found in the bulletin from the company, or —
Circle Inform-A-Gram No. B74.

The Hydra-Cycle Contour Mill is described in Bulletin CRH-57 from Colonial Broach and Machine Co., Colonial-Romulus Div'n, Parkgrove Sta., Detroit 5. Application photos are used to point out the capabilities of the hand-guided tracer machine in aircraft and die work. In addition, the bulletin contains specifications and features of the full line. Also covered is the Erector Set model of the contour mill.
Circle Inform-A-Gram No. B75.

Enviromental Temperature Cabinets that are mechanically operated from −225°F to +350°F are detailed in a bulletin from Webber Corp., P.O. Box 217, Indianapolis 6. These cabinets are used for research and production, shrink-fitting of metals, stabilization of steels, hardening of metals, etc. The bulletin lists the standard features and top opening specifications. Also given are optional features.
Circle Inform-A-Gram No. B76.

Fast, Non-Destructive Testing is performed by an ultrasonic resonance instrument. A bulletin gives complete data on the advantages of using the Vidigage to measure thickness of metal, etc., from one side, and to find corrosion, laminar discontinuities, or other flaws. The bulletin contains sections on specific applications, accessories, and specifications. Get your copy of Bulletin V-200 by writing to Branson Instruments, Inc., 37 Brown House Rd., Stamford, Conn., or —
Circle Inform-A-Gram No. B77.

Power Lubrication is possible with Lincoln automatic centralized systems for original equipment or existing facilities. Three types of push-button Multi-Luber power lubrication systems are available — air, vacuum, or manually operated. A bulletin details these three and shows typical installations. In addition, it describes and illustrates the models that are produced by the company. Details are found in Bulletin 811 prepared by Lincoln Engineering Co., St. Louis 20, Mo., or —
Circle Inform-A-Gram No. B78.

ARE YOU USING- HOVIS UNIVERSAL Master COMPOUND DIES

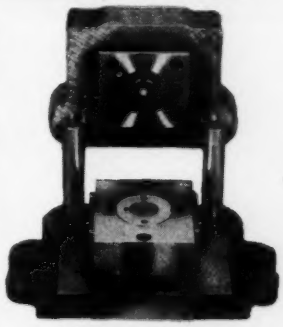
to Produce WASHERS and SMALL STAMPINGS from all Types of Materials the ECONOMICAL WAY?

SAVES

DESIGNING COST
TIME • LABOR
MATERIALS
STORAGE SPACE

The "MODERN METHOD" adopted by MANUFACTURERS NATIONALLY

NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART



● By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

Made in 5 sizes:
¾" - 1½" - 2½" - 4" - 6"

Specialists in designing and manufacturing MULTI-DIES as well as supplying COMPLETE TOOLING FOR ALL SIZES OF NUT FORMERS

Write for Literature

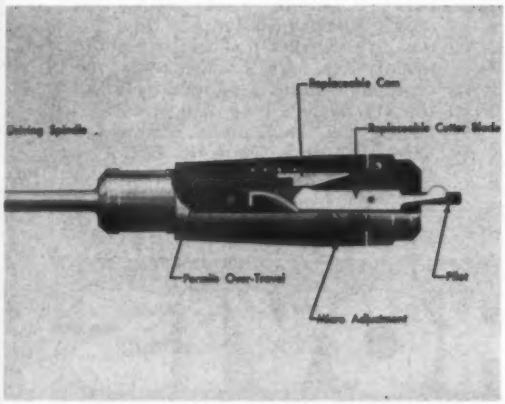
HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD • BOX G • VAN DYKE, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 157

PRODUCTS

NEW DEVELOPMENTS · IMPROVEMENTS · COST AND TIME SAVERS

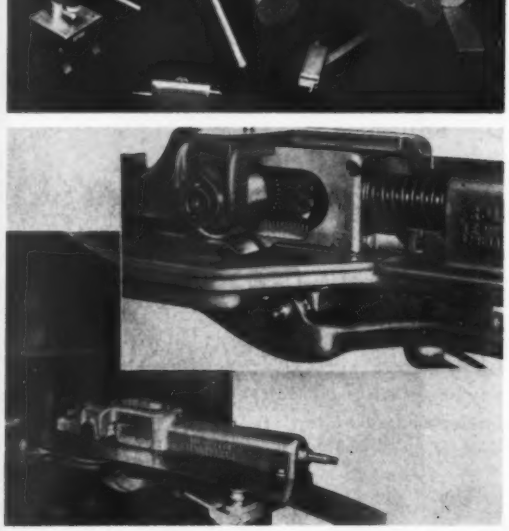


COUNTERSINK TOOL .

Rapid, direct access for cutting angles and radii on reverse surfaces is offered by the BakSink tool. It can also be used for back-forming and grooving. This tool with micro-set accuracy within close tolerances is adaptable for production use. Cogsdill Tool Products, Inc., 12980 W. 8 Mile Rd., Oak Park 37, Mich., or — **Circle No. A1.**

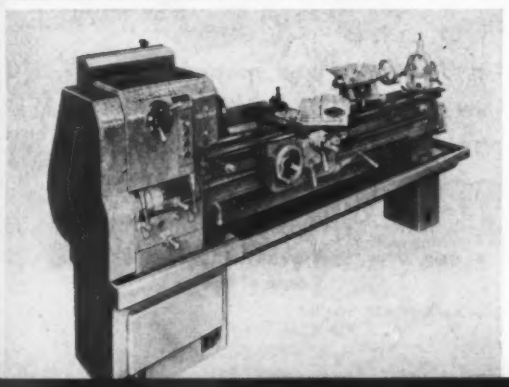
MAGNETIC BASE . . .

This magnetic base and precision test indicator attachments are used to test inside and outside surfaces. Shown are the square block, swivel joint, and indicator attachments to fit all tools. The base needs no clamping and won't dislodge from machine vibration. Koch Test Indicator, 28 - 2nd Ave., Nyack, N. Y., or **Circle No. A2.**



PRESS FEED . . .

The 12" Rol-Di-Feed can be mounted to feed in any direction for die, piercing, blanking, compound, progressive, or draw. It is a self-contained, cam driven punch press feed that is smooth in operation and silent. H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass., or — **Circle No. A3.**



TRACER LATHE . . .

Automatic turning of multiple diameter shafts and contoured workpieces with standard lathe versatility is performed by the Hydraguide tracer lathe. It can also be used for many boring and facing operations. Cincinnati Lathe & Tool Co., Cincinnati 9, O., or — **Circle No. A4.**

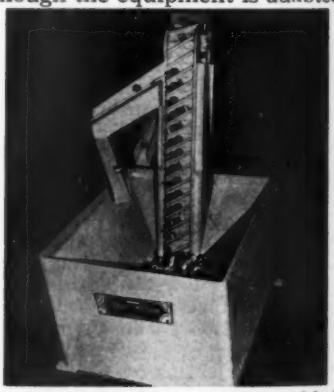
BORING PACKAGE PLAN . . .

This plan is made up of three packages, offering convenience, efficiency, and economy. The boring bar 4-some package contains four boring bars with a boring range from 1" to 3⅛" dia, providing a short and long carbide tipped tool bit for each size bar.

Three complete assemblies including cartridges, carbide-tipped tool bits, and wrenches are found in the boring bar cartridge package. The boring head 2-some package has a 2" dia and 3" dia head, two long and two short tool bits with a boring range from 2¾" to 5¼" dia. Literature on the Sure Bore package plan can be obtained from Portage Double Quick, Inc., 1046 Sweitzer Ave., Akron 11, O., or — **Circle No. A5.**

FEEDING DEVICE . . .

Automatic elevating, orienting, and feeding of parts to automated production lines is performed by a combination feeding device. The unit will handle parts that roll or slide such as gears, cylinders, and spiders. Although the equipment is adapted



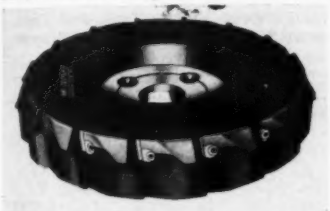
to a specific job, it is assembled from standard components. Michigan Tool Co., Gear-O-Mation Div'n, 7173 E. McNichols Rd., Detroit 12, or — **Circle No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

MILLING CUTTERS . . .

Series 900 cutters available with either square or triangular indexable carbide inserts have been introduced by McCrosky Tool Corp., Meadville, Pa. They assure easy indexing and highly accurate positioning of the inserts in the body. Eliminated are



the time and cost of regrinding blades. These cutters featuring Super-Jack blade locking wedges, perform efficiently at the heavy feeds and high speeds of high production milling. Full details on Series 900 cutters are found in Bulletin 572 supplied by the company, or—**Circle No. A7.**

LARGE CAPACITY PRESS . . .

Designed with oversize dimensions to accommodate larger dies is Model 55 large capacity press. It will economically handle laminations, trimming of die castings, and similar bulky operations. This 56-ton metalworking unit has a 4″ standard stroke,

with up to 12″ strokes available at extra cost. Standard throat depth is 15″. The press is produced in either flywheel or geared type, in mechanical or air clutch models. The Federal Press Co., Elkhart, Ind., or —
Circle Inform-A-Gram No. A8.

LUB SYSTEM . . .

A new cooling and lubricating system for high speed cutting tools has been announced by Precise Products Corp., Racine, Wis. A blast of vapor is created at the point where the cutting is done. A coolant line and an air line are used.
Circle No. A9.

SHEAR-MATIC . . .

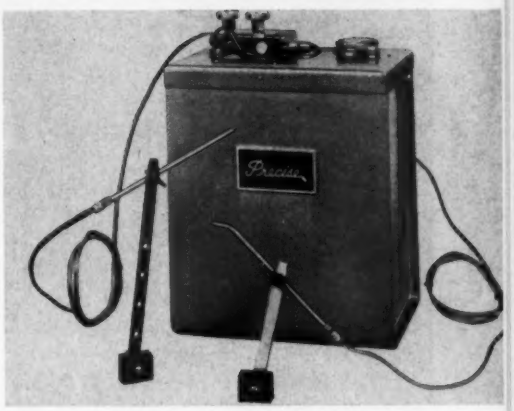
Increased production and safety are features of the Shear-Matic machine, which cycles a shear automatically. It transfers the sized sheets away quickly and places them in perfect rectangular stacks. The desired length is obtained by adjusting a metering device. Die & Automation, Inc., 1490 Edison Ave., Hamilton, O., or — **Circle No. A10.**

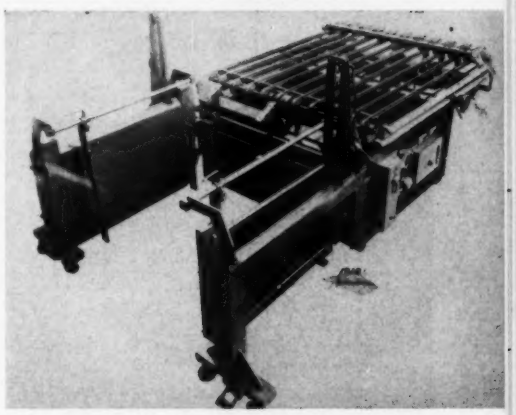
GUN TYPE DRILLING MACHINE . . .

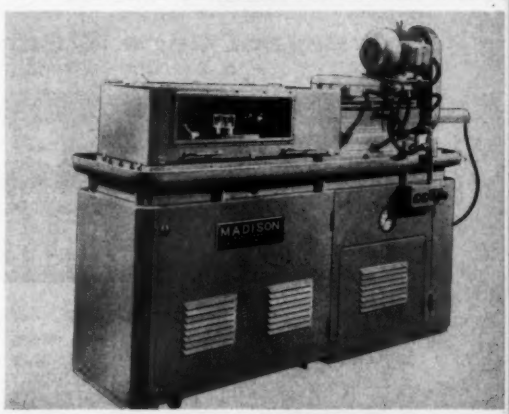
Spindle speeds up to 8000 rpm with feeds from 0″ to 40″/min are features of a gun type drilling machine. It will accommodate gun type drills up to 1″ dia. The workpiece is held stationary with the spindle rotating. The machine's base encloses a coolant system. Madison Industries, Inc., Muskegon, Mich., or—**Circle No. A11.**

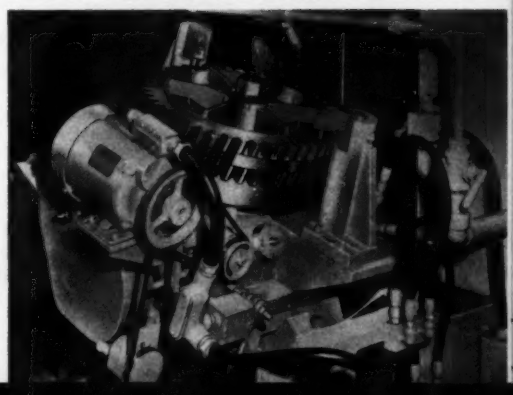
INDEXING TABLE . . .

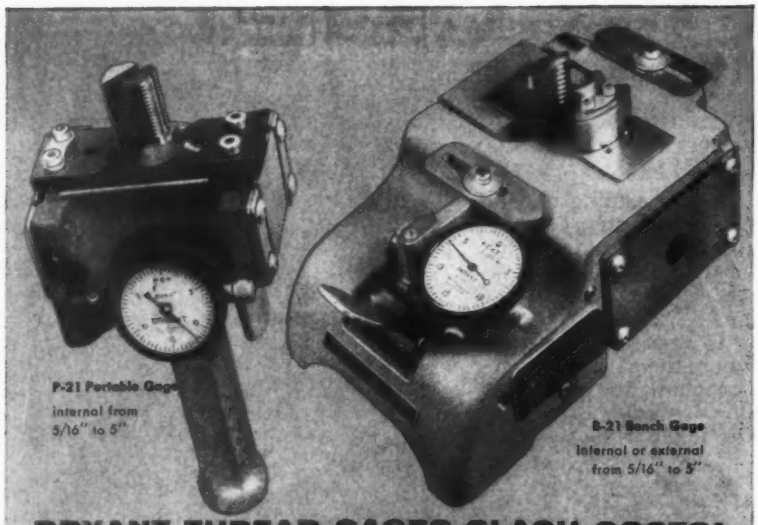
An indexing table for positive parts positioning has been developed by Colonial Broach and Machine Co., P. O. Box 37, Harper Sta., Detroit 13. It provides positive index to tenths and no backlash. Available in 11″, 18″, and 28″ dia, the table is designed for horizontal broaching machines.
Circle No. A12.









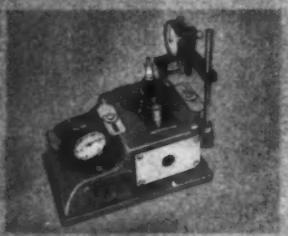


BRYANT THREAD GAGES SLASH COSTS!

Check these important features!

- **WEARABILITY** 10 to 20 times longer life than conventional plugs and rings!
- **SPEED of GAGING** 8 to 10 times faster than conventional plugs and rings!
- **SIZE CLASSIFICATION** permits the use of statistical quality control methods, — allows process inspection at the machine or at final inspection — positive classification by giving exact readings on every piece.
- **EASE of OPERATION** thumb lever collapses segments — rapid no wear loading.
- **VERSATILITY** Attachments for checking squareness of face, concentricity and other specialized applications.

WRITE FOR COMPLETE INFORMATION


Concentricity Attachment

Bryant Gage & Spindle Division

P. O. Box 620-F, SPRINGFIELD, VERMONT

Division of Bryant Chucking Grinder Company

CIRCLE INFORM-A-GRAM KEY NO. 1601

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE

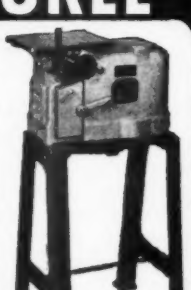
DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.



Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY

228 PARK AVENUE BELGIUM WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1602

CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings,

Michigan

DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery, Sheet Metal Stampings and Assemblies.

UNIVERSAL GEAR & MACHINE CO.
1301 E. McNichols Road
Detroit, Michigan, Forest 6-2280
Gears, Sprockets, Worms, up to 168". Free Catalog of 8,000 Stock Items. Free 36-page Catalog on our manufactured machinery of complete slitting, uncoiling, recoiling and cut to length lines.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, Ohio.
MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring

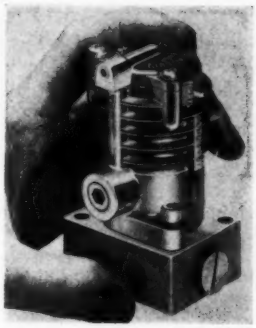
NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines. Special Machinery, Tools, Dies, Jigs, Fixtures.

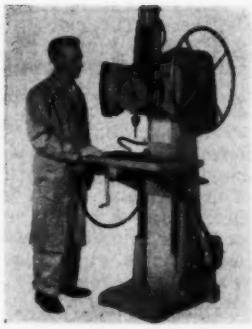
Pennsylvania

MEDAL MANUFACTURING CO.
328 Vine St., Sharon, Pa. Machined parts, complete machine assemblies, special machinery. Send us your prints for quotes.

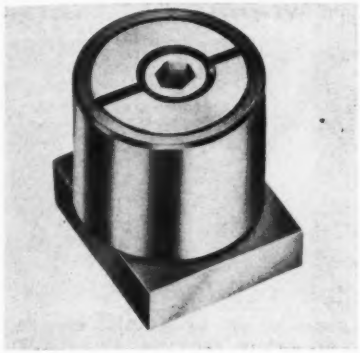
Control Small Double-Acting Cylinders and similar devices with a new miniaturized pilot-operated 4-way valve. The 4" high Bantam 4-way valve, weighing 30 oz, has only three working parts. It is designed for 2-point mounting with pressures from 15 to 140 psi. Valvair Corp., 454 Morgan Ave., Akron 11, O., or —
Circle No. A13.



Any Combination of Six Operations can be done in one setup by the new Burgmaster turret drill. It drills holes up to ⅜" in steel, has a 7" stroke, and a speed range of 325 to 4050 rpm. The drill features fast power indexing, a sensitive feed, and preselected speeds and stops. Quick-change tools are eliminated, increasing accuracy. Burg Tool Mfg., Co., Gardena, Calif., or —
Circle No. A16.

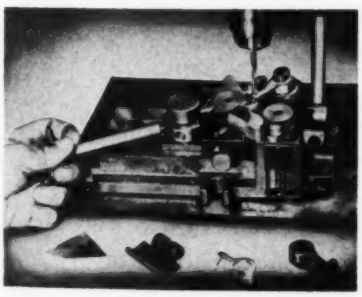


Zero Concentricity in Seconds for lathe fixtures mounted on slotted surface plates is possible with the new Ace eccentric fixture key. It quickly and accurately corrects any misalignment of face plates and mill-



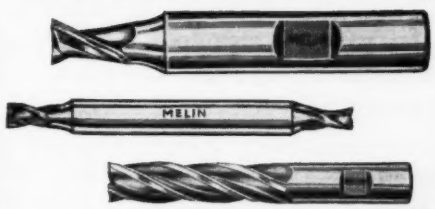
ing fixtures up to 1/16". Interchangeable keys make fixtures adaptable to any machine having standard width key slots. Ace Drill Bushing Co., Inc., 5407 Fountain Ave., Los Angeles, or —
Circle Inform-A-Gram No. A14.

Designed for Holding Irregularly Shaped Objects is the improved Model B Prestoflex Varijaw speed vise. This tool can be used as a variable jig or fixture setup, a speed vise



or an assembly clamp, without time-consuming setups. A quick-acting screwless locking mechanism can be set for adjustable locking pressures or parts relocation. The Custanite Corp., 1228 Utica Ave., Brooklyn 3, N. Y., or —
Circle Inform-A-Gram No. A15.

MELIN
END MILLS



There is a difference in end mills . . . MELIN end mills! Proof of this is evident in the continued increase in MELIN popularity. The growth in MELIN tool acceptance was by no means an accident . . . The secret is in *CONSISTENT QUALITY*. This standard of Quality assures you better performance . . . longer lasting performance . . . CONTINUOUSLY . . . from one shipment to another. Next time you order end mills . . . specify the finest . . . specify MELIN.

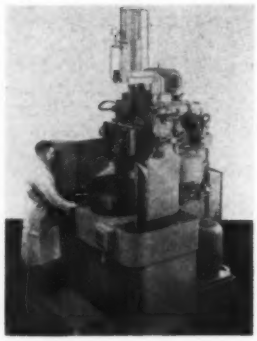
MANUFACTURED IN TWO, THREE AND FOUR FLUTE TYPES.

Representatives in principal cities.

MELIN TOOL COMPANY, INC.
3371 West 140th Street
Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 161

Contour Turning, Boring, and Facing; straight boring; surface grinding and honing; I.D. and O.D. grinding; and contour, horizontal, or straight milling are performed by a new series of single station precision finishing machines. The BL-1 Series is available in single or double spindle models and with single, multiple, or variable spindle speed drives. The New Britain Machine Co., Hoern & Dilts Div'n, Saginaw, Mich., or — **Circle No. A17.**



A 4000-Lb Capacity Hoist has been added to the line of air-powered hoists made by Gardner-Denver Co., Keller Tool Div'n, Grand Haven, Mich. Fitted with either roller or link chain, the lifting and lowering speed varies from a creep to 10 fpm at full load and 90 psig air line pressure. Length of lift is 8'. The hoist operates with either a one-hand control bar or remote pendent control.
Circle No. A18.

Question: Which is a Bearing-izing tool?

Answer: All four are Bearing-izing Tools! *

Remember . . . COGSDILL BEARING-IZING TOOLS are engineered for each application to meet your requirements. As no two problems are exactly alike . . also no two Cogsdill Bearing-izing designs are exactly alike. Our experienced Engineering Staff design the tool for finishing bores, thrust faces and some contours to less than 10 RMS with accuracy to low tenths, to meet your special problems.

* 1 Flat surfaces & multiple diameters. 2 Angular valve seats. 3 Bottoming within .015. 4 Blind or shouldered holes.

Send your part print for our recommendation

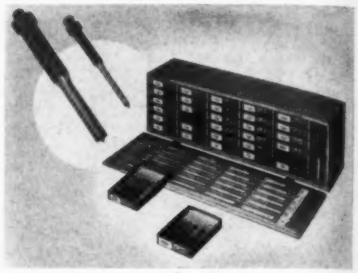
Cogsdill

TOOL PRODUCTS, INC.

14033 W. Eight Mile Road, Oak Park 37, Michigan

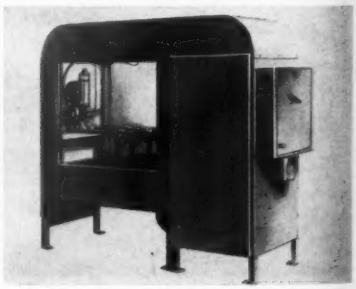
CIRCLE INFORM-A-GRAM KEY NO. 162

Punch Blank Assortments are now available from Dayton Perforators, Inc., Dept. 14, 1336 Stanley Ave., Dayton 4, O. Five each of thirty different sizes of hardened, centered, and tru-ground punch blanks are



packaged in wood cabinets. Each size has a separate drawer. The blanks are ready for the grinder and finish sizing. They can be altered to any shape without loss of hardness. There are three assortments — basic heavy-duty, and close-spacing.
Circle Inform-A-Gram No. A19.

Designed for Deburring, Polishing, Micro Inch Finishing, and generating radii on machine parts is a new type of deburring machine. The reciprocating action of Model 50 Reciprotron operates on the principle of fixturing parts in racks, which are placed into



quick releasing rack holders. The fixturing design prevents marring and nicking of the parts. Eliminated is the need for unloading and loading media, water, and compound after each cycle. Metal Parts Sales Co., 165 Delancey St., Newark, N. J., or— **Circle Inform-A-Gram No. A20.**

CY-CO-TROL CUTTER GUARDS

safety maintenance of multiple tooth cutters

← **PROTECTS OPERATORS HANDS**
← **PROTECTS CUTTER BLADES**
← **PROTECTS FINISHED PARTS OF MACHINE**
← **ELIMINATES** costly applications of hot-dip plastic material directly to your cutters.

Cutter Guard holds to cutter by a spring pressure band to which segments are fastened and CUTTER GUARD UNIT IS COMPLETELY COATED WITH A TOUGH PLASTISOL MATERIAL which gives ultimate protection to cutter teeth. CY-CO-TROL CUTTER GUARDS are available for any size cutter, from 4" in diameter to 20" in diameter. Guards for cutters of larger diameters, guards for cut-off saws, or special shaped cutters can be supplied on special order.

Write for Catalog

ROYAL design and manufacturing, inc.

4133 E. TEN MILE RD., CENTER LINE, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1631

Aget offers more! Over 38 standard Dustkop models to choose from . . . *Plus* engineering service to help you select, provide, and install the proper accessories and fittings to complete your dust collecting system. Write for illustrated folder . . . Today!

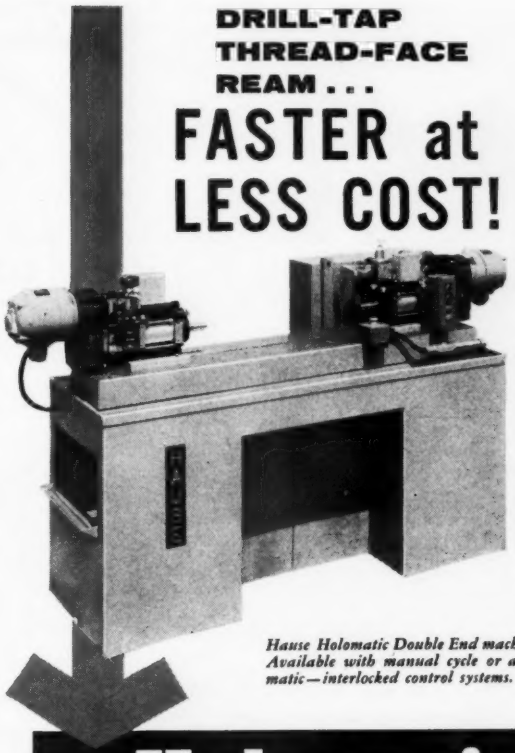
AGET MANUFACTURING COMPANY

1394 E. CHURCH STREET • ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1632

DRILL-TAP THREAD-FACE REAM . . .

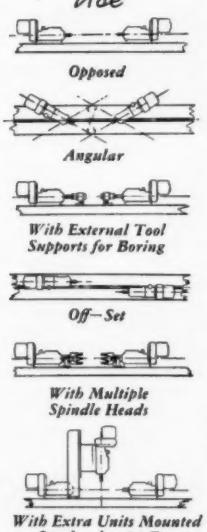
FASTER at LESS COST!



Hause Holomatic Double End machine. Available with manual cycle or automatic—interlocked control systems.

with a Holomatic

Methods of Use



• Hause Holomatic Double End machines are designed specifically to perform *two or more* drilling, tapping, threading, reaming, thread rolling, chamfering, spot facing—or similar operations *at one time.*

Holomatic units use factory air supplies for thrust power and a self-contained hydraulic system provides positive, infinitely adjustable control of the rapid travel and feed movements of the quill.

A Holomatic Double End machine efficiently handles parts up to 35" long by 18" in diameter. Capable of drilling ⅝" in mild steel, tapping ¾"—16 and cycling speeds up to 3600 full length strokes per minute. Easy to set up using standard air clamps, index tables and other part locators.

A Holomatic Double End machine in your plant will quickly pay for itself—even on low quantity production work. Investigate the many advantages of the Holomatic system—now!

• *Write today for complete information plus an actual obligation-free Holomatic demonstration in your plant.*

Hause MACHINES, INC.

MONTPELIER, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1633

M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

Cut inspection time in half

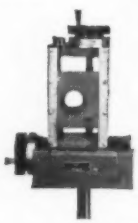
with new Gaertner Coordinate Cathetometers

These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.



M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53

The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 1641

FOR THE "HOLE" FIELD

NEW CONCEPT IN AUTOMATIC DRILLING AND TAPPING UNITS

MODEL 500 DULL TOOL LITE AND SUB-BASE

AUTOMATION | DRILLMATION | TAPMATION

Drillmation's hydraulic, locked-circuit feed Drilling and Tapping Units are the finest and most completely self-contained of any similar unit available today. Drillmation also offers more essential and exclusive features. Write TODAY for literature.

12 ESSENTIAL Exclusive FEATURES in 1 Unit

- **DULL TOOL CONTROL** Unit will withdraw tool from work and indicate to operator when tool becomes dull.
- **RAPID TOOL CHANGE** Tool may be replaced without changing the controls.
- **UNIFORM TIME CYCLE** Maintains comparatively constant time cycle even when tools become dull.
- **SELF-CONTAINED HYDRAULIC SYSTEM** Delivers only the oil pressure required to overcome machining resistance.
- **COMPLETELY AUTOMATIC** Enclosed electric controls. Unit is "Fail Safe".
- **THRUST CONTROL** Maximum thrust may be set to protect tools. Will not surge at break point.
- **FEED CONTROL** Infinitely variable and positive feed rate.
- **RAPID APPROACH AND RETURN** Variable irrespective of RPM.
- **MICRO DEPTH CONTROL** Depth will repeat within .0005 inch.
- **EMERGENCY QUILL RETURN** Button on front of unit. Aid in setting tools.
- **COOL OPERATION** Low volume high pressure hydraulic pump used on power stroke only. Air power used for rapid traverse.
- **PRODUCTION MACHINE** Mount in any position. Quiet operation. Self lubricating.

DRILLMATION

DRILLMATION CO.
6500 E. ELEVEN MILE ROAD
CENTER LINE, MICHIGAN
JEfferson 9-2030

CHICAGO OFFICE DRILLMATION SALES and SERVICE
5653 W. NORTH AVE. • MErrimac 7-3305

CIRCLE INFORM-A-GRAM KEY NO. 1642

CAMS

To Your Specifications

• • • • •

— Except Screw Machine Cams —

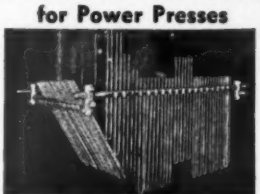
• • • • •

Design Assistance Offered

KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1643

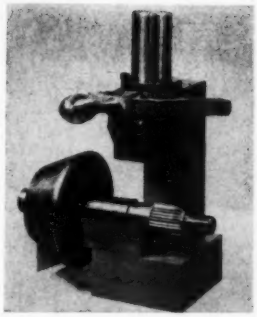
ADJUSTABLE ROD GUARD
for Power Presses



HUMM SAFETY EQUIPMENT CO.
MFGR. OF COMPLETE LINE OF PRESS GUARDS
249 Sheffield Ave. • BROOKLYN 7, N. Y.

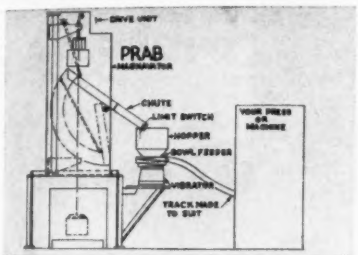
CIRCLE INFORM-A-GRAM KEY NO. 1644

Mark Metal Components at production machines with this hand-operated spring percussion press. Its capacity is six 1/16" characters. These fixtures are built to order. Dimensions vary according to workpiece and lettering required. Geo. T. Schmidt, Inc., 4112 Ravenswood Ave., Chicago 13, or — **Circle No. A21.**



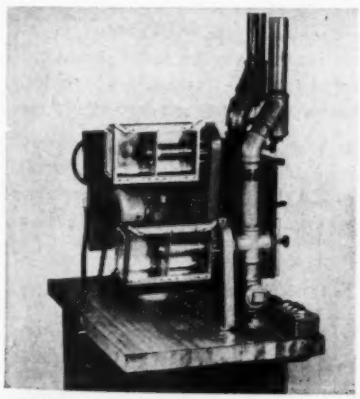
Lapping and Refinishing of carbide or ceramic cutting tools is performed by the Hyprez machine. It features meehanite lapping wheels, which oscillate as they rotate with a controlled variation of stroke from 0" to 1". The wheel moves across the edge of the tool or insert while it is held firmly in place. Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **Circle No. A24.**

Eliminate the Human Element in the Loading of Automatic Presses and assembly machines with a completely automated small parts feeding system. It transfers, meters, and feeds small parts from skids or receiving containers to their desired



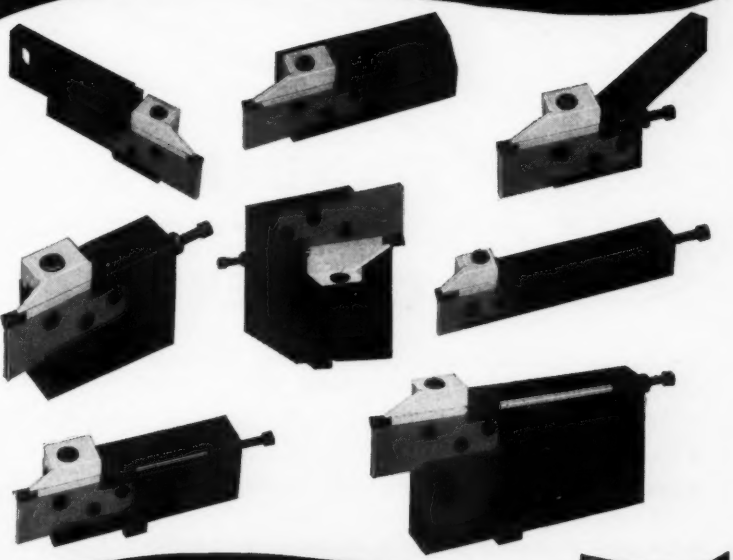
locations for further manufacturing operations. The system incorporates the Magnavator magnetic small parts elevator which is used with a bowl feeder. Prab Conveyors, Inc., 30121 Groesbeck Hwy., Roseville, Mich., or **Circle Inform-A-Gram No. A22.**

Completely Automatic Loading of a wide variety of parts is possible with a new loading machine. The Freeloader, using the blow-loading principle, can handle screw machine



or stamped parts as well as parts fabricated by other methods. Three Freeloader models are available. Whitso, Inc., Blow-Loading Div'n, Dept. TPC, 9330 Byron St., Schiller Park, Ill., or — **Circle Inform-A-Gram No. A23.**

NOW...A CUT-OFF TOOL for EVERY Application . . .



The complete line of P.D.Q. (Portage Double Quick) Manchester cut-off tools includes tooling for all makes of Turret Lathes, Engine Lathes, Production Lathes, Automatics and Cutting-Off Machines.

This wide selection of carbide tools, designed specifically for each type of machine, offers real speed and economy in parting and grooving problems. Write for the illustrated catalog covering all the available standard types. Specials available on request

PDQ

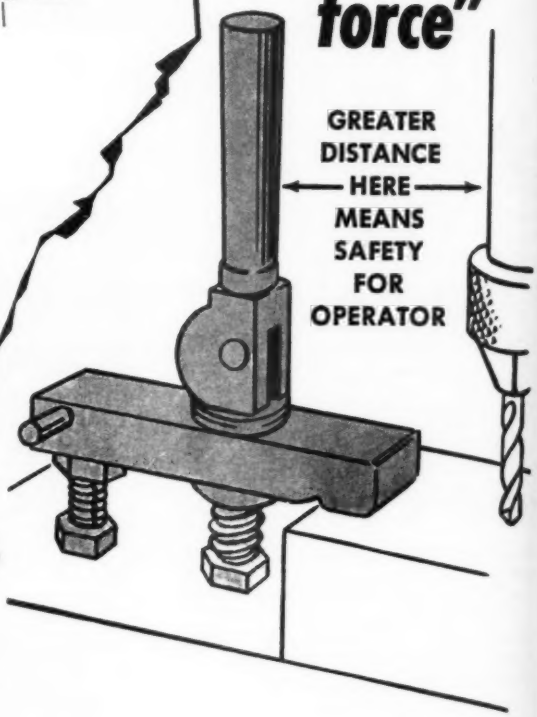
PORTAGE Double-Quick, Inc.

1046 SWEITZER AVENUE • AKRON 11, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 165

*CERTIFIED . . . "up to 3,450 lbs. of clamping force"

*
THE JAMES H. HERRON CO.
LABORATORIES
Testing · Analysis · Inspection · Coal Investigation · Non Destructive Testing
1360-1364 WEST THIRD STREET
CLEVELAND 13, OHIO
MAIN 1-5443
May 11, 1956
The Standard Parts Company
1000 Broadway
Bedford, Ohio
Re: Our Order M-7281
Gentlemen:
With reference to the Double Cam-Lever (500) and Eye-Bolt (500), we have conducted experiments to determine the amount of clamping force a man can exert with this device, lubricated.
Without the use of any auxiliary equipment, it was found that a man could exert up to 3,450 pounds, by bringing the lever to a position 90° with the Eye-Bolt.



with

STANDARD'S DOUBLE ½" (500) CAM LEVER

This Double Cam Lever offers superior design and engineering features—assuring greater safety, performance, strength and durability.

- **Maximum Job Clearance.**
- **Safe Operation—with handle *vertical* before clamping (as illustrated).**
- **Constant Maximum Clamping Pressure—perpendicular to center line of lever.**
- **Certified 6-Ton Back-Pressure Resistance—no danger of cam backing up.**
- **Ready to Use—no altering needed on assembly.**
- **No Lever Breakage—solid steel handle.**
- **This cam can be applied to your specially designed assemblies. Quotations on request.**

If it's a Standard Part, you know it's GOOD!

OVER 500 OTHER STANDARD JIG AND FIXTURE COMPONENTS

Standard Parts Company offers the most complete line of fine quality tool room standards available today. All Standard components incorporate the latest safety, efficiency and performance features desired by the trade... as typified by the Double Cam Lever shown on this page.

You can depend on Standard Components... they will never let you down (with down-time and work stoppages). Our New Sixth Edition CATALOG—covering our complete line—is now ready for you. Tracing sheets are available.

Write for New Sixth Edition

FREE CATALOG

56 *pages*

Manufacturers of GENUINE NOBLE & STANTON Parts

STANDARD PARTS CO.

1002 BROADWAY, BEDFORD, OHIO • TWX BEDFORD, O. 462

CIRCLE INFORM-A-GRAM KEY NO. 166

INFORM-A-GRAM

JULY 1957 ISSUE

DO NOT USE THIS CARD AFTER SEPT. 30, 1957

TOOLING and PRODUCTION:

Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.)

ADVERTISEMENTS

2	22	41	60	107	136	171	664	1284	1434	1822	1691	1772	1854	1966
3	23	42	61	108	137	172	1201	1321	1441	1823	1692	1773	1861	
4	24	43	62	111	139	175	1202	1322	1442	1681	1693	1774	1862	
5	25	45	63	112	141	176	1231	1323	1443	1582	1694	1775	1863	
6	26	46	64	113	142	179	1232	1324	1471	1583	1695	1781	1901	
7	27	47	65	114	145	180	1233	1381	1472	1584	1701	1782	1902	
8	28	48	67	116	146	183	1241	1382	1473	1561	1702	1783	1903	
9	29	49	68	116	149	184	1242	1383	1474	1562	1703	1811	1951	
10	30	50	70	118	150	187	1261	1401	1481	1563	1704	1812	1952	
11	31	51	95	119	153	188	1262	1402	1482	1601	1705	1813	1953	
12	32	52	96	121	154	189	1263	1403	1483	1602	1706	1814	1971	
13	33	53	97	122	157	191	1264	1404	1484	1631	1707	1821	1972	
15	34	54	98	125	161	194	1271	1405	1485	1632	1731	1822	1973	
16	35	55	99	129	162	199	1272	1406	1486	1633	1732	1823	1981	
17	36	56	101	130	165	200	1273	1407	1511	1641	1733	1824	1982	
18	36	57	102	131	166	661	1281	1431	1512	1642	1741	1851	1983	
20	39	58	103	133	167	662	1282	1432	1513	1643	1742	1852	1984	
21	40	59	106	135	168	663	1283	1433	1521	1644	1771	1853	1985	

EDITORIAL ITEMS

A1	A19	A37	A55	B1	B19	B37	B55	B73
A2	A20	A38	A56	B2	B20	B38	B56	B74
A3	A21	A39	A57	B3	B21	B39	B57	B75
A4	A22	A40	A58	B4	B22	B40	B58	B76
A5	A23	A41	A59	B5	B23	B41	B59	B77
A6	A24	A42	A60	B6	B24	B42	B60	B78
A7	A25	A43	A61	B7	B25	B43	B61	C1
A8	A26	A44	A62	B8	B26	B44	B62	C2
A9	A27	A45	A63	B9	B27	B45	B63	C3
A10	A28	A46	A64	B10	B28	B46	B64	C4
A11	A29	A47	A65	B11	B29	B47	B65	C5
A12	A30	A48	A66	B12	B30	B48	B66	C6
A13	A31	A49	A67	B13	B31	B49	B67	C7
A14	A32	A50	A68	B14	B32	B50	B68	C8
A15	A33	A51	A69	B15	B33	B51	B69	C9
A16	A34	A52	A70	B16	B34	B52	B70	D1
A17	A35	A53	A71	B17	B35	B53	B71	
A18	A36	A54	A72	B18	B36	B54	B72	

Which article in this issue was of most interest to you? _____

Is our new cumulative index of any value to you? _____

THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

Our reader service department is handling over 100,000 reader inquiries per year and it is essential that the blanks at the top of each card be filled in accurately and completely. Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.

INFORM-A-GRAM

JULY 1957 ISSUE

DO NOT USE THIS CARD AFTER SEPT. 30, 1957

TOOLING and PRODUCTION:

Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.)

ADVERTISEMENTS

2	22	41	60	107	136	171	664	1284	1434	1822	1691	1772	1854	1966
3	23	42	61	108	137	172	1201	1321	1441	1823	1692	1773	1861	
4	24	43	62	111	139	175	1202	1322	1442	1681	1693	1774	1862	
5	25	45	63	112	141	176	1231	1323	1443	1582	1694	1775	1863	
6	26	46	64	113	142	179	1232	1324	1471	1583	1695	1781	1901	
7	27	47	65	114	145	180	1233	1381	1472	1584	1701	1782	1902	
8	28	48	67	116	146	183	1241	1382	1473	1561	1702	1783	1903	
9	29	49	68	116	149	184	1242	1383	1474	1562	1703	1811	1951	
10	30	50	70	118	150	187	1261	1401	1481	1563	1704	1812	1952	
11	31	51	95	119	153	188	1262	1402	1482	1601	1705	1813	1953	
12	32	52	96	121	154	189	1263	1403	1483	1602	1706	1814	1971	
13	33	53	97	122	157	191	1264	1404	1484	1631	1707	1821	1972	
15	34	54	98	125	161	194	1271	1405	1485	1632	1731	1822	1973	
16	35	55	99	129	162	199	1272	1406	1486	1633	1732	1823	1981	
17	36	56	101	130	165	200	1273	1407	1511	1641	1733	1824	1982	
18	36	57	102	131	166	661	1281	1431	1512	1642	1741	1851	1983	
20	39	58	103	133	167	662	1282	1432	1513	1643	1742	1852	1984	
21	40	59	106	135	168	663	1283	1433	1521	1644	1771	1853	1985	

EDITORIAL ITEMS

A1	A19	A37	A55	B1	B19	B37	B55	B73
A2	A20	A38	A56	B2	B20	B38	B56	B74
A3	A21	A39	A57	B3	B21	B39	B57	B75
A4	A22	A40	A58	B4	B22	B40	B58	B76
A5	A23	A41	A59	B5	B23	B41	B59	B77
A6	A24	A42	A60	B6	B24	B42	B60	B78
A7	A25	A43	A61	B7	B25	B43	B61	C1
A8	A26	A44	A62	B8	B26	B44	B62	C2
A9	A27	A45	A63	B9	B27	B45	B63	C3
A10	A28	A46	A64	B10	B28	B46	B64	C4
A11	A29	A47	A65	B11	B29	B47	B65	C5
A12	A30	A48	A66	B12	B30	B48	B66	C6
A13	A31	A49	A67	B13	B31	B49	B67	C7
A14	A32	A50	A68	B14	B32	B50	B68	C8
A15	A33	A51	A69	B15	B33	B51	B69	C9
A16	A34	A52	A70	B16	B34	B52	B70	D1
A17	A35	A53	A71	B17	B35	B53	B71	
A18	A36	A54	A72	B18	B36	B54	B72	

Which article in this issue was of most interest to you? _____

Is our new cumulative index of any value to you? _____

FIRST CLASS
PERMIT No. 7879
CLEVELAND, O.

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed in the United States

4c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO

FIRST CLASS
PERMIT No. 7879
CLEVELAND, O.

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed in the United States

4c POSTAGE WILL BE PAID BY—

TOOLING and PRODUCTION

1975 LEE ROAD

CLEVELAND 18, OHIO

Hollow Mill Maker finds

DBL-2
High Speed Steel

HARD, TOUGH and VERSATILE

The maker of these adjustable hollow mills required a steel that would give top performance in a variety of jobs—turning, tapering, facing, chamfering and trepanning. After thorough testing, Allegheny Ludlum's high speed DBL-2 was selected.

DBL-2 is an improved general-purpose high speed steel. It contains tungsten, molybdenum and vanadium in such proportions that it excels 18-4-1 for most applications. DBL-2's unusual combination of high hardness with toughness, its ability to hold a fine grain over a wide hardening range, and the fact that it easily machines many diverse types of stock, made it particularly well suited for this job.

In addition to these advantages, DBL-2 can be heat treated in the same furnaces and atmospheres as 18-4-1 without fear of harmful decarburization. These DBL-2 blades were heated to 2250 F., oil quenched and drawn twice at 1025 F. After heat treatment, blades easily machined such stock as aluminum, stainless steel, carbon steel, aircraft steel, plastics, bronze, screw stock, cast iron and brass.

There is an A-L tool steel to meet your toughest requirements. For further information call your A-L representative or distributor today, or write . . . .
Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.

Write For Copy of "CUTTING TOOL MATERIALS"
This 36-page illustrated booklet analyzes and compares types and covers grade selection for all major classes of cutting tools, etc., invaluable data for production men. Write for your copy today.

ADDRESS DEPT. TP-91

For nearest representative, consult Yellow Section of your telephone book.

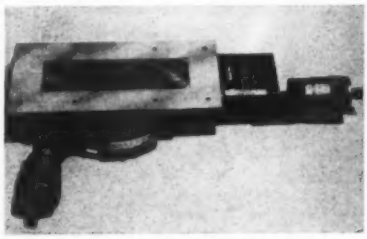
For complete **MODERN** Tooling, call
Allegheny Ludlum

WSW 6634

AL® FINE TOOL STEELS SINCE 1854

CIRCLE INFORM-A-GRAM KEY NO. 167

Precise Measurements and Micro-Adjustments are handled by a new 1" x 6" measured travel co-ordinate stage. It is designed primarily for use with the Stocker & Yale lines of optical comparators, but can also be used with microscopes or other means of optical observation. Readings are made on a choice of micrometers — 0.0005" or 0.0001" increments. The top surface is flat, 50 sq in in area with a series of eight tapped holes to aid in fixturing. Stocker & Yale, Inc., Marblehead, Mass., or — **Circle Inform-A-Gram No. A25.**



Forged Safety Tools are now being offered by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 46. Included are adjustable and box wrenches, pliers of various types, pneumatic tools, air hammer chisels, and air hammer points. These tools are used in refineries, chemical and powder plants, and other industries that handle explosive or inflammable materials. In addition, they are used in making adjustments to radar or electronic equipment.
Circle Inform-A-Gram No. A26.

Over 450 Parts Are Eliminated in the new all-hydraulic line of gasoline or L.P. gas operated fork trucks. The design of Speedlift trucks is reported to reduce parts and maintenance costs as much as 95%. On the trucks there are no clutch, transmission, differential, drive shaft, and differential axle. Pettibone Mulliken Corp., 141 W. Jackson, Chicago, or —
Circle Inform-A-Gram No. A27.

Designed for Interchangeable Use on any make or type of air gage instrument is a line of multiple-amplification contact air gage cartridges. They are used in checking hard-to-reach surfaces and relationship dimensions involving O.D., I.D., steps, eccentricity, concentricity, flatness, parallelism, and similar gaging applications. The interchangeable use of the cartridges eliminates using a specific cartridge for a specific tolerance range and reduces the size of the inventory needed. Dearborn Gage Co., Air Gage Div'n, 22038 Beech St., Dearborn 8, Mich., or —
Circle Inform-A-Gram No. A28.

Allison
Abrasive Cutting Wheels

Abrasive Cutting Know-How

Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

FINE FINISH and NO BURNING with ABRASIVE CUTTING in YOUR TOOL ROOM

for fast, cost-saving, fine-finish cuts of such Tool Room materials as these...

- **High Speed Steel**
- **Tool Steel**
- **Heat Treated Steel**
- **Oil Hardening, Air Hardening and Shock Resistant Alloys**

Nearly everyone knows that Abrasive Cutting is the fastest, lowest-cost means of cutting the tougher, harder metals...at cutting speeds of 6 to 10 seconds per square inch of cut...in sizes ranging from the smallest stock to 12" x 12" solid billets and 14" diameter tubing.

But many metal-working men are not yet aware of the fact that these same Abrasive Cutting benefits of speed and low cost are applicable to critical Tool Room Materials...that abrasive cuts of heat-sensitive metals can be made with Fine Finish and No Burning, Checks or Cracks.

It's not a trick...it's a matter of Know-How...the kind of Know-How that is available to you through your Allison Field Engineer, an experienced Abrasive Cutting Specialist. He is likely to prescribe wet cutting for most tool room metals...dry cutting for metals adversely affected by the quenching action of coolants ...wheels with the types and sizes of abrasive grains, the particular bond and hardness that fit the jobs to be done...thin wheels (available from Allison from .006" thickness) and special spindle speeds for fine slotting...quick, economical methods of salvaging worn tools or cutting blanks of stock for special tools needed in a hurry.

***For more complete information** write for this helpful booklet —*
ABRASIVE CUTTING BY ALLISON

ACCO

Allison Division • AMERICAN CHAIN & CABLE

254-T Island Brook Avenue, Bridgeport 8, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 168

WALLS TU-WAY BELT SANDER

Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION
333 Nassau Avenue Brooklyn 22, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1691

.0003 HOLE LOCATION IN 1 MINUTE

EDGE FINDERS

$2.50 NEW POSTPAID except C.O.D. **$10.00 DELUXE**

- THOUSANDS HAVE PROVEN AND ACCEPTED THE DELUXE MODEL FOR YEARS.
- JUMPS SIDEWAYS AS SHOWN WHEN LOCATION IS REACHED.
- NEW .500 DIA. MODEL FOR LARGER WORK ONLY. .200 Dia.

ADJUSTABLE VISE STOP

$2.95

HUNDREDS OF PIECES TO A .0003 TOLERANCE WITH THIS HARDENED VISE STOP THAT IS ADJUSTABLE IN ALL DIRECTIONS. ATTACH TO VISE WITH ONE ¼—20 TAPED HOLE.

Dealer Inquiries Invited

GLOVER MFG. CO.
422 Park Ave. Meadville, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1692

monroe

THE MOST PROGRESSIVE FIXTURE CLAMP LINE

Catalog available from
monroe
Engineering Products
1515 Hurd Road
Monroe, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1693

NEW Contour Gripping FIXTURE

SAVES YOU MONEY!

TAKE BIGGER CUTS
- **FASTER**
- **SAFER**
- **CHEAPER**

NO MORE BLOCKING SHIMMING HOLDS ANY SHAPE IN ANY POSITION

THOUSANDS OF USES

This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.

Investigate its possible application in your business. Write for further details or demonstration.

WRITE for Further Information Today

Act Now!

AMPOGRIP CORP.

10-0 Olivine Street • Willimansett • Mass.

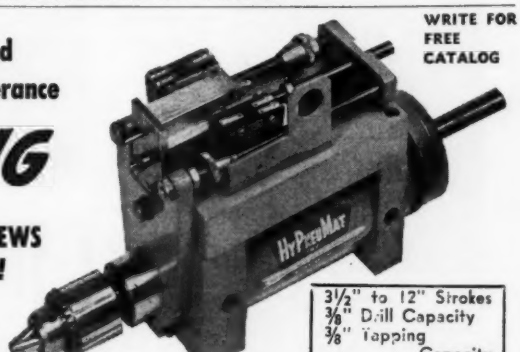
CIRCLE INFORM-A-GRAM KEY NO. 1694

NOW High Speed Close Tolerance

TAPPING

WITHOUT LEAD SCREWS OR TAPPING HEAD!!

WRITE FOR FREE CATALOG



HYPNEUMAT

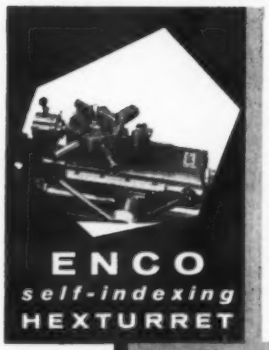
AUTOMATIC DRILLING AND TAPPING UNITS!

- SEALED UNIT Construction permits mounting in any position.
- AIR or HYDRAULIC Control.
- ENCLOSED ELECTRICAL SWITCH for remote electrical operation.
- QUILL CLAMP EXTENSION — extremely close radial grouping.
- EASILY INTERLOCKED with indexing tables, automatic work feeders.

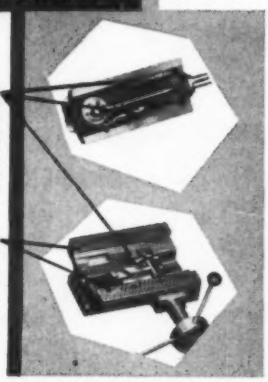
HYPNEUMAT INC. 647 West Virginia St., Milwaukee 4, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 1695

how DOUBLE means constant accuracy!



Enco Hexturret accuracy at work. A close tolerance shoulder screw job held to plus .002; minus .000.



Double Drive An Enco exclusive! Twin steel gears and racks equalize feed of tool on work, prevent twisting, assure precision.

Double Gibs Heavy duty type with close adjustment for maintaining constant accuracy.

- Custom-built to fit all lathes from 9" to 16".
- All bearing surfaces hand scraped
- All parts of indexing mechanism hardened to assure accuracy.

There's an ENCO turret for every lathe. Write today for Catalog No. 53.

ENCO

Manufacturing Co. • 4524 W. Fullerton
Chicago 39, Ill. • Dept. 777

CIRCLE INFORM-A-GRAM KEY NO. 1701

MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

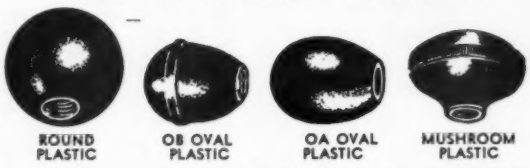
MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guesswork or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 3 No. 100 for 6" Vernier Calipers; 3 No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; 3 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.
For Complete Information Write, Phone or Wire

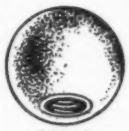
STEBAR COMPANY
215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1702

REID TOOL ROOM *Accessories*

BALL HANDLES — Threaded




ROUND STEEL

Designed for machine tools, jigs, fixtures, shift lever handles etc. and give your product that "dressed-up" appearance. Made in a wide variety of diameters and thread sizes. Round and oval plastic available in red and black. Steel ball handles are turned from bar stock. Highly polished. Low prices and the finest quality.

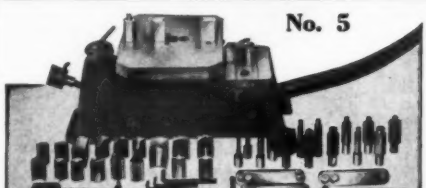
Also clamping handles, C.I. Hand knobs, Mall. mach. handles, compression springs, hand wheels and many other accessories and components at low prices.

Quality at Moderate Prices!

FREE 64 Page Catalog

REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1703



WRITE FOR DESCRIPTIVE CIRCULAR

Multiform

BENDER-CUTTER

CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ½"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x4" air operated.

ALSO AIR OPERATED MODELS

J. A. RICHARDS CO. KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1704

Monarch Precision SHAPLANE Radius Tools

Illustration shows convex cutter for ¼" to 2½" balls.

FIVE MODELS for LATHES, SHAPERS, PLANERS, BORING MILLS

Range ½" to 3" for concave Radii. Also heavy duty models for radii to 6" on planers, etc.

PATENT PENDING

Write for circular

C. B. TEETER, TOOL ROOM SPECIALTIES
4470 Oakenwald Ave., Chicago 15, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1705

JIG BORING
and
Large Precision Machining
Done to your specifications
We Have
21 Jig Borers

KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1706

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1707

Increased Versatility in Optical Gaging is offered by Model 14-6 Kodak contour projector. It has a micrometer device for horizontal measurements and features ample table travel to simplify staging. it is

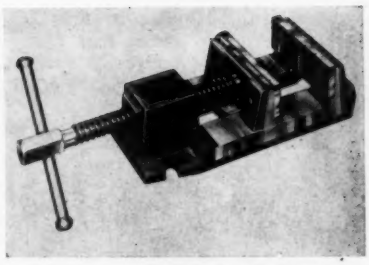
ideal for receiving inspection operations. In combination with the high-contrast viewing screen, the measurement system makes possible magnified micrometric measurements for toolroom optical gaging. Optical Gaging Products, Inc., 26 Forbes St., Rochester 11, N. Y., or —
Circle Inform-A-Gram No. A29.

A New Small Size Liquid Spring using liquid compressibility and built into a bolt has been announced by Taylor Devices, Inc., 188 Main St., N. Tonawanda, N. Y. Model 1099 for low spring rates is designed to permit the spring action to be built within a structure. It has a spring rate of 500 lbs preload and 1,000 lbs end load with a 2½" stroke. Complete details are found in Catalog LS issued by the company, or —
Circle Inform-A-Gram No. A30.

A Traveling Head for Buffing Work has been announced by Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich. Model 50-108 travels with the work, providing more buffing time on areas

that are difficult to reach. It can be used on straight-line conveyors and certain continuous rotary automatic applications. The traveling head can be used with buffs, setup wheels, abrasive belts, and wire or tampico brushes.
Circle Inform-A-Gram No. A31.

This Solid Base Drill Press Vise can be turned on edge for accurate drilling at a 90° angle. The ends of the base are cut back and the sides of the vise are machined to form a true right angle with drill press tables. The vise features low overall height and maximum working depth. Two models are made, one with conventional screw action and one with rapid action. Wilton Tool Mfg. Co., Inc., Schiller Park, Ill., or —
Circle Inform-A-Gram No. A32.



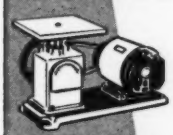
Saves Time, Saves Money - - and Does the Job Better

the NEW

KELLER Die Filers

DELUXE: Files, Saws, Laps. Has File Roller Support Arm and Overarm.

Standard: With File Roller Support Arm for Maximum Accuracy



ECONOMY: Has no File Roller Support Arm or Overarm.

- Self Compensating File Chuck
- Wide Capacity— 1/8" diam. to ½" x 5/8" Files.
- Throat Depth 7¼"
- Two Speeds— 350/450 strokes per minute.
- Full 1½-Inch Stroke.

Built-for-the-Job Handles all shapes and sizes of files from 1/8" diam. to ½" x 5/8". File Roller Support has full 6-inch adjustment for Maximum Accuracy on all jobs.

Large 8½" x 8½" Worktable with plenty of room for clamping guide blocks, etc. Table tilts up-to 15-degrees in any direction and is locked by four knurled thumbscrews.

Long, Dependable Service . . . the Scotch Yoke is splash lubricated and equipped with Oilite Bearings throughout.

Plenty of Power — ¼ H.P. 1800 rpm motor.

Write for Bulletin 256, and your distributor's name.

SALES SERVICE MACHINE TOOL CO.
2351 University Ave. St. Paul W14, Minn.

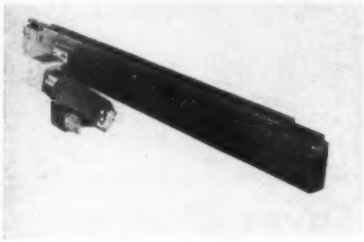
ACCESSORIES: Steel Floor Stand, Hinged Belt Guard, and Gooseneck Lamp.

KELLER *Power* **Die Filers**

Built by the makers of KELLER Power Hack Saws

CIRCLE INFORM-A-GRAM KEY NO. 171

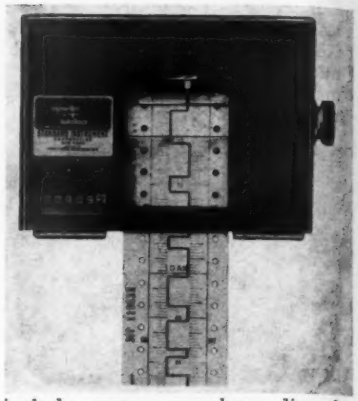
Speed the Movement of Cylindrical In-Process Workpieces between machines with an adjustable transfer conveyor. Model 1000 mechanizes the removal and transfer of workpieces of ⅛" to 1 9/16" dia. The unit



can be used with centerless grinders, and similar machines and inspection equipment. The speed of the chain conveyor can be regulated between 5 to 20 fpm and the feed of parts adjusted to the speed of the machine. Production Feeder Corp., 3130 Johnnycake Ridge Rd., Mentor, O., or —

Circle Inform-A-Gram No. A33.

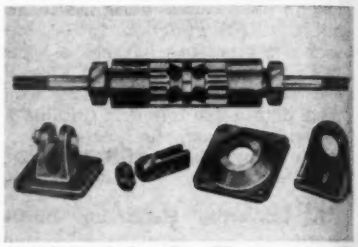
Better Machinability and Finish are possible using a new tool steel which contains 0.10% of sulphur. Oilgraph-EZ is used for drill jig bushings of small diameter and for carbon steel taps. Other applications



include gages; punches; dies for forming, blanking, and trimming; shanks; carbide tools; machine spindles; and arbors. The steel can be obtained in bars and bar stock. Allegheny Ludlum Steel Corp., Pittsburgh 22, or —

Circle Inform-A-Gram No. A34.

A New Line of Cylinders has been introduced by The A. K. Allen Co., 57 Meserole Ave., Brooklyn 22. Allenair Type B cylinders are for air, water or hydraulic service. They are produced in bores of 1½", 2", 2½", 3", and 4", with either single ended or



double ended rods. They are available as double acting or single acting spring return cylinders. Cushions are supplied for both ends as well as interchangeable foot, flange and swivel mounts to permit mounting in any manner or position.

Circle Inform-A-Gram No. A35.

A Grip Ring Assembly Tool has been developed by Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y. Model GR spreads the ring to the exact diameter required

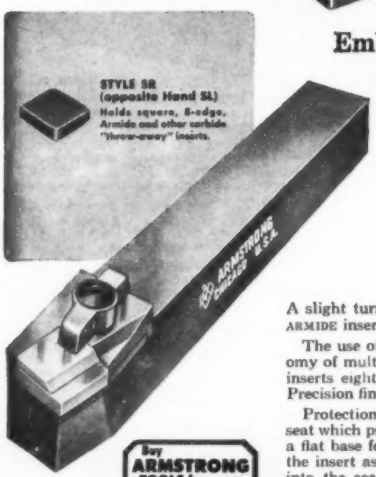
for installation, automatically preventing overspreading and permanent set. This tool designed for Waldes Truarc Series 5555 grip rings, makes possible faster assembly and disassembly, and is better suited to high-volume production.

Circle Inform-A-Gram No. A36.

New

ARMSTRONG

Armide CARBIDE INSERT TOOL HOLDERS



Embody...Convenience, Economy Simplicity and Strength based on these superior features:

- **IMPROVED CLAMPING METHOD — speeds indexing of Inserts.**
- **REPLACEABLE SEAT of Hardened Tool Steel — protects shank and provides flat base to prevent damage to inserts as they are clamped in position.**
- **SHANK of Heat Treated Alloy Steel — gives extra strength and rigidity.**

A slight turn of a single screw permits rapid indexing of the ARMIDE insert — reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts — triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

Buy ARMSTRONG TOOLS from your Industrial Distributor

Write for catalog

ARMSTRONG BROS. TOOL CO.

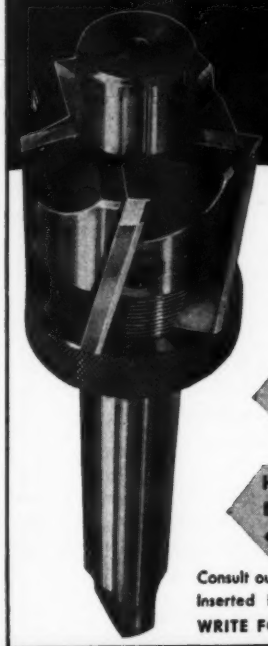
"The Tool Holder People"

5220 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 172

INSERTED BLADE GENESEE

FACING AND COUNTERBORING TOOLS



Interchangeable Pilots

Constant Chip Space Throughout Life of Blades

Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks

H.S.S.—Carbide Tipped Blades. Save 25% or more over cost of Solid Tools

Consult our Engineering Department on your Inserted Blade Production Tool Problems.
WRITE FOR CATALOG 54P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools • Since 1908

CIRCLE INFORM-A-GRAM KEY NO. 1731

PINPOINT MACHINE WEAR . . .
MISMATED PARTS . . . WITH
SPERRY BEARING TESTER

The Bearing Tester consists of a metal probe, or pickup, and a compact electronic amplifier. Any malfunctioning in a moving part is transmitted through the probe and shows itself by a change in the noise level and the noise pattern visually presented on the tester's calibrated dial. Lightweight, easily portable, the Sperry Bearing Tester is a positive asset to preventive maintenance, quality control, and receiving inspection.

Bulletin 61-105 describes the Sperry Bearing Tester. Write for your copy.

406 Shelter Rock Road Danbury, Connecticut

sperry products INC.
First in Ultrasonic Inspection

CIRCLE INFORM-A-GRAM KEY NO. 1732

New CATALOG
WM. SOPKO & SONS CO.
GRINDING WHEEL ADAPTERS
AND TOOLROOM ACCESSORIES

finest quality ADAPTERS

- Precision-made, Hardened and Ground with Heat Treated Nuts
- Complete Line—4 New Models Available
- For Use on All Popular Surface Tool and Cutter Grinders
- Large Stocks—Immediate Delivery

USE SOPKO ADAPTERS—SAVE TIME, TROUBLE AND MONEY

WM. SOPKO & SONS CO.
140 E. 267th ST. • EUCLID 32, OHIO

Please send your New Free Illustrated CATALOG

NAME TITLE

COMPANY

STREET

CITY STATE

CIRCLE INFORM-A-GRAM KEY NO. 1733

ACCURACY .0002 T.I.R.

.0002 T.I.R. OR LESS AT SPINDLE NOSE, .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost. Same Accuracy Guaranteed!

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

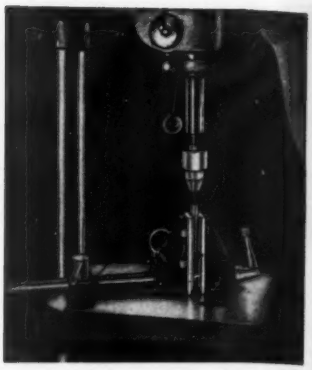
The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

K. O. LEE COMPANY
ABERDEEN, SOUTH DAKOTA

CIRCLE INFORM-A-GRAM KEY NO. 1741

You need both on your drill press



Step Up Production with Two AMF Tools

The AMF *Wahlstrom Chuck* will help change tools in seconds, safely. The *fully-automatic* Wahlstrom makes it possible to drill, ream, counterbore with *one spindle* and without moving work. No keys, collets or wrenches.

The AMF *Float-Lock Vise* turns a drill press into a complete machine tool. Easy to mount—in minutes. Horizontal and vertical "V" grooves align and grip rounds securely for end drilling and centering. Many other uses on every set-up.

Write for details and name of nearest distributor.

AMF Tool Division
AMERICAN MACHINE & FOUNDRY COMPANY
224 Glenwood Avenue, Bloomfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1742

DIE DESIGNING AND ESTIMATING

Fourth Edition

368 pages, 26 chapters, over 400 illustrations, charts and graphs. 165 Practical Points in Die Design and Construction. Comprehensively indexed.

Written expressly for Die Designers, Die Engineers, Tool and Die Makers, Owners and Managers of Tool and Die Shops and Depts., Students, Apprentices and valuable, too, as a reference and refresher for the die experts who are more than qualified to write a comparable text.

Price, only $7.50 per copy.

Immediate shipment.

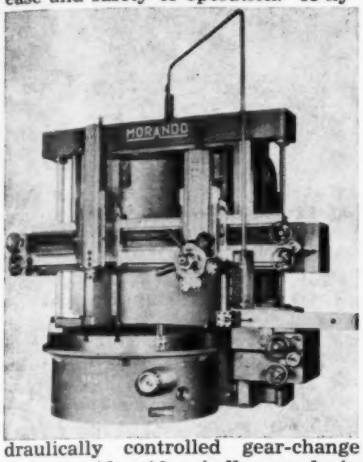
HUEBNER PUBLICATIONS, INC. TP-6
1971 Lee Road, Cleveland 18, Ohio

Gentlemen: please ship immediately_____copy (copies) of DIE DESIGNING AND ESTIMATING, Fourth Edition at $7.50* per copy.

COMPANY_____
BY_____
ADDRESS_____
CITY_____ZONE____State_____

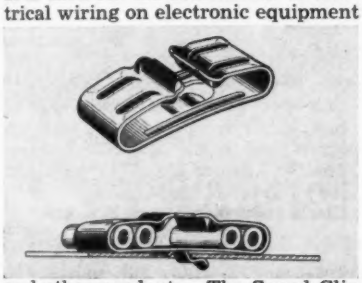
Open account shipments on purchase orders or rated companies. Otherwise, check must accompany order. No C.O.D.'s please. *Ohio customers add 3% sales tax.

Seven Sliding Head Combinations can be set up on this vertical boring and turning mill. Morando Model VK20 features great capacity, and ease and safety of operation. A hydraulically controlled gear-change unit provides 16 spindle speeds in three ranges, dependent on individual requirements. Maserati Corp. of America, 662 Main St., Westbury, L. I., N. Y., or —



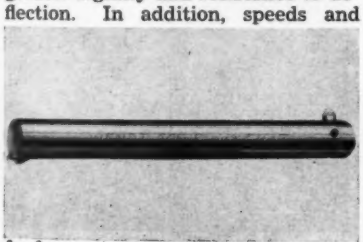
Circle Inform-A-Gram No. A37.

A Twin U-Type Speed Clip has been developed by Tinnerman Products, Inc., 8700 Brookpark, Cleveland. It is used for the attachment of electrical wiring on electronic equipment and other products. The Speed Clip is front-mounting and eliminates the need for nuts, bolts or auxiliary fastening devices. It is ideal for use in hard-to-reach locations.



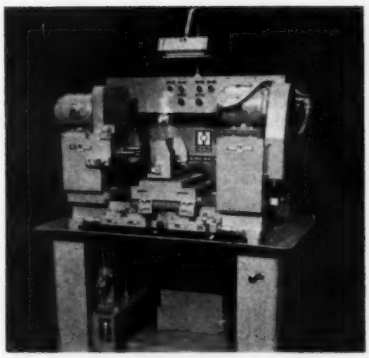
Circle Inform-A-Gram No. A38.

Reduce Vibrations with a new line of boring bars made from No-Chat heavy metal. These boring bars have greater rigidity and resistance to deflection. In addition, speeds and feeds can be increased and the bars used with greater overhang for deep hole boring. Seven boring bars in overall lengths to 12" are produced. Wendt-Sonis Co., Hannibal, Mo., or



Circle Inform-A-Gram No. A39.

Versatility and Economy in the Accurate Machining of Small Parts are provided by a small-size unitized finishing machine. Designed around a number of standard, interchangeable units, Model O Bore-Matic can be set up as a dozen different basic machines with many combinations in standard tooling and fixture equipment. It will perform straight and taper boring, straight and taper turning, facing, chamfering, grooving diameters and faces, and reaming, singly or in any combination. The Heald Machine Co., Dept. 0, Worcester 6, Mass., or —



Circle Inform-A-Gram No. A40.

GREIST MICRO-SCRIBERS®
mark hard metals fast!

Now in 2 sizes... Heavy-Duty and Slim-Line

Solid carbide tip stays sharper, longer! Scribes fine lines on hardened steel, ceramics, plastics, gems, glass.

Diamond lapped to correct tip angle that gives you fast, easy, close-tolerance layouts.

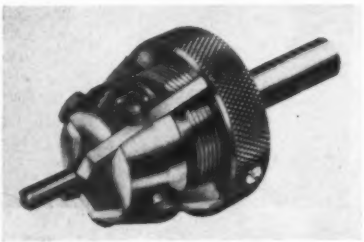
Hexagonal aluminum body—anodized for extra protection. Packaged in clear "plastic bubble" that protects precision tip.

Order a half-dozen from your Greist distributor today! Specify **Heavy-Duty** or **Slim-Line.** Only **$1.00** each.

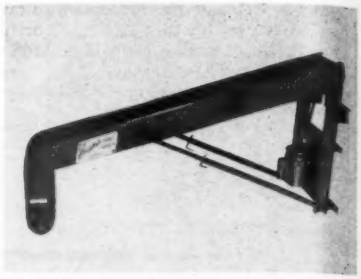
THE **GREIST** MANUFACTURING COMPANY
487 Blake Street, New Haven 15, Connecticut
Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 175

An Increase in the Size Range of the tube deburring tool manufactured by Genesee Mfg. Co., 566 Hollenbeck St., Rochester 21, N. Y., has been announced. The tool is now available for tubing with from $\frac{3}{16}$" to 1¼" O.D. It is designed to face the end and chamfer the inside and outside of standard tubing in one operation. The cutters and pilot reamer are replaceable and are adjustable for size control.
Circle Inform-A-Gram No. A41.

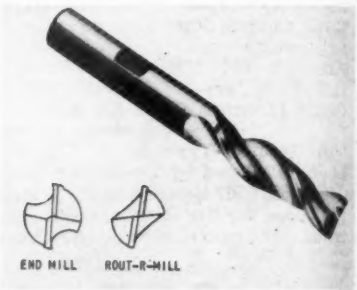


Maintain Full Magnetic Control of the Material being conveyed to the discharge point with a magnetic conveyor with extended delivery. The angle of incline can be set so that the receiving end of the conveyor fits under the discharge chute of all standard presses. When the angle



of incline is reduced, conveyor reach is extended so that the extension section can be centered over the tote box. The Homer Mfg. Co., Inc., Dept. 382, Lima, O., or —
Circle Inform-A-Gram No. A42.

Designed for Deep Cavity Milling of Titanium, stainless steel, aluminum, and other alloys is the Rout-R-Mill. It can be used at speeds up to 17,000 rpm. The flute structure of



the new tool provides faster chip clearance at greater depths and accomplishes rough, hogging cuts and finish cuts in one operation. Arrow Tool & Reamer Co., 711 Stephenson Hwy., Troy, Mich., or —
Circle Inform-A-Gram No. A43.

Surface Grinding and Plunge Cutting Hard, Brittle Materials are handled by a portable, bench-type ultrasonic machine tool. The Sheffield-Cavitron machine can cut a ½" dia

in one cut and can be adjusted vertically through a 3" feed range. The tee-slotted work chuck has a 6" x 8" capacity. The Sheffield Corp., Dayton 1, O., or —
Circle Inform-A-Gram No. A44.

FOR HARDENING AND TEMPERING ALL TOOL STEELS

HEVI-DUTY High Temperature "G-05-PT" FURNACE
Hardening of high speed steels and other operations requiring high temperatures can be performed in this furnace. The muffle may be sealed if a protective atmosphere is required.
Temperatures to 2600°F.

HEVI-DUTY "Multiple Unit" MUFFLE FURNACE
This complete self-contained furnace is ideal for small scale production heat-treating requiring temperatures to 1850°F. All controls are conveniently mounted in the pyramid base.
Temperatures to 1850°F.

HEVI-DUTY "Multiple Unit" TEMPERING FURNACE
Forced, high speed air circulation assures rapid and uniform heating for tempering all tool steels. Removable shelves provide greater capacity, yet this furnace requires little bench space.
Temperatures to 1250°F.

HEVI-DUTY ELECTRIC COMPANY
MILWAUKEE 1, WISCONSIN
Heat Treating Furnaces... Electric Exclusively
Dry Type Transformers *Constant Current Regulators*

CIRCLE INFORM-A-GRAM KEY NO. 176

WALTER

PRECISION DIVIDING ROTARY TABLES

With and Without Dividing Discs

- READABILITY: 6 SECONDS.
- CONSTRUCTED FOR LONG LIFE.
- MAINTAIN PRECISION.
- AVAILABLE IN 10", 12½", 15¾", 19¾", 25", 31".

Also many types of Universal Precision Dividing Heads and Attachments for most economical production.

Test reports furnished with literature.

Sole Agents for U.S.A.

KARL A. NEISE

404 FOURTH AVE., DEPT. TP
NEW YORK 16, N. Y.

NEISE MODERNTOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1771

LARGE CAPACITY GRINDING

SURFACE—48" x 144"
INTERNAL—24" x 42" and 36" x 24"

- Fast precision jobbing
- Ground steel plate
- Tool and die steels ground to YOUR specifications
- Wear plates
- The best possible grinding service at the lowest cost.

WRITE FOR DESCRIPTIVE LITERATURE

Let us solve your Grinding Problems

MICRO PLANE Inc.

EN. 1-3770
7017 ST. CLAIR AVE.
CLEVELAND 3, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1772

Magnetic Base Indicator holders

Erick
Magna Holder
Model 2008
Only $6.50

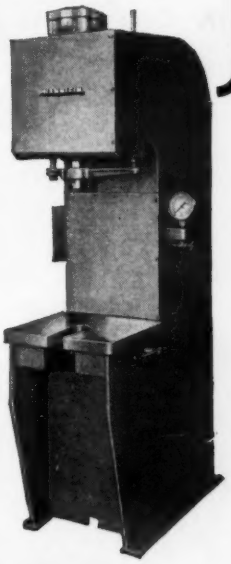
See your dealer or write for catalogue 755 on the most complete line of magnetic base units & access. mfg'd.

CULLEN MFG. CO., RACINE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1773

PRICE LIST

ON HANNIFIN STOCK HYDRAULIC PRESSES



1-TON, Bench Type	$ 605
2-TON, Bench Type	$ 680
5-TON, with Base	$1,530
8-TON, with Base	$1,605
10-TON, Floor Type	$2,290
25-TON, Floor Type	$3,790

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

HANNIFIN

HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1774

For most economical threading on all Automatic Screw Machines, Chucking machines, Bolt threaders, Drill presses, etc.

H & G insert chasers

CUT YOUR COSTS AND DOWN TIME

For less than $45 you get 12 sets of ¾-16 (or any stockable size) Insert Chasers; each set ground ready for business. This dozen sets can thread hundreds of thousands of parts with no down time or sharpening time. Can be thrown away when dull or if you prefer, flash grind the dull sets and make an extra profit. Threads stand critical examination and conform to the close tolerances of Class 3 fits. Send for our digest of the Government publication, "UNIFIED AND AMERICAN SCREW THREADS".

THE EASTERN MACHINE SCREW CORPORATION 29-49 Barclay St., New Haven, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1775

DRILL FINISHED* HOLES

IN ONE *HIGH-SPEED* OPERATION

WITH SEALOL'S

DRILL ADAPTOR

AND

COOLANT SUPPLY UNIT

FOR GUN-DRILLING

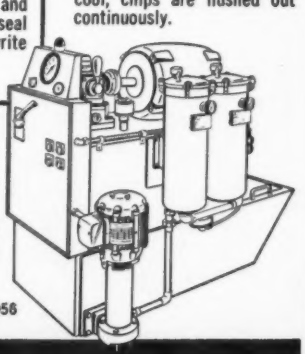
The HEART of your DRILL ADAPTOR

Gun drilling has revolutionized the production of accurate holes. For example, gun drilling saved $12,674.52 in drilling three shallow holes in each of 342 breech rings at the Watervliet Arsenal. Manufacturing methods engineers say that production time was cut by 71%!**

Your plant can save substantially and increase production by adapting your present drilling equipment for gun drilling with Sealol's Drill Adaptor and Coolant Supply Unit.

SEALOL DRILL ADAPTOR — transfers coolants from a stationary source to the rotating gun drill at speeds to 10,000 RPM — pressures to 1,000 PSI. Coolant is delivered through gun drill directly to cutting edge. Work runs cool, chips are flushed out continuously.

THE SEALOL Mechanical Seal provides **positive protection** against leakage along a rotating shaft. Widely used in aviation, process, oil and other industries. For specific seal application in your business, write Sealol today!



SEALOL HI-PRESSURE COOLANT SUPPLY UNIT — filters, cools and pumps coolant at pressures to 1,000 PSI — volume to 40 GPM (higher capacities available) for precision drilling of all types.

*to Gun Drill Tolerances
**American Machinist — Aug. 13, 1956

SEALOL CORP

DEPT. M, WARWICK INDUSTRIAL PARK, PROVIDENCE 5, R. I.

Please send me Bulletin information on Sealol gun drilling equipment.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 1781

New! **"TRICO-MIST" COOLANT SYSTEM**

FOR DRILLING — TAPPING — MILLING
SAWING — GRINDING, ETC.

- *Portable*
- *Efficient*
- *Inexpensive*

Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRI-CO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray.

Unit attaches to shop air line, (25 to 150 lbs.)

- Speeds and production are increased.
- Tool life is increased — stay sharp longer.
- Permits heavier roughing cuts — saves time.
- Cutting saws last 80% longer.
- Diamond wheels last 5 to 10 times longer.
- Prevents thermoplastics from welding to tools.
- One gallon coolant lasts 14 hrs., average use.
- Available with one and five gallon containers—single or multiple outlets — single or dual valve controls.

SEND FOR FREE BULLETIN NO. 37-A

TRICO FUSE MFG. CO. MILWAUKEE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 1782

HARDEST MAN-MADE METAL!

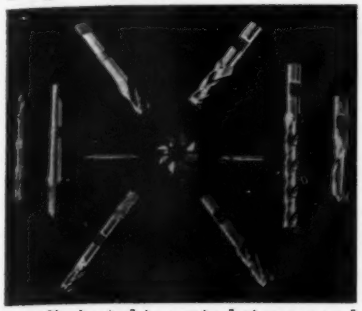
● New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

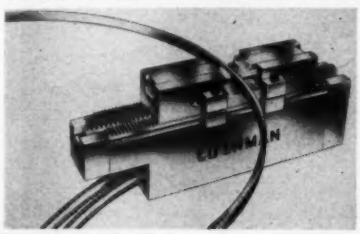
CIRCLE INFORM-A-GRAM KEY NO. 1783

Newly Designed High Speed End Mills have been added to the product line of Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. With these end mills featuring Advance-Design construction, sharp corners



are eliminated to control stresses and strains. New flute shapes and types of relief are incorporated to provide freer cutting action and additional cutting edge strength.
Circle Inform-A-Gram No. A45.

For Use on Vertical or Horizontal Spindle Machines is an automatic pinch jaw chuck. It was especially developed for chucking parts of large diameter and small cross section without strain or distortion while

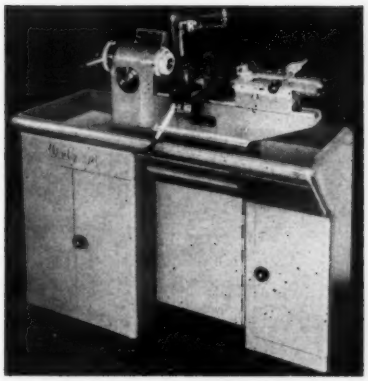


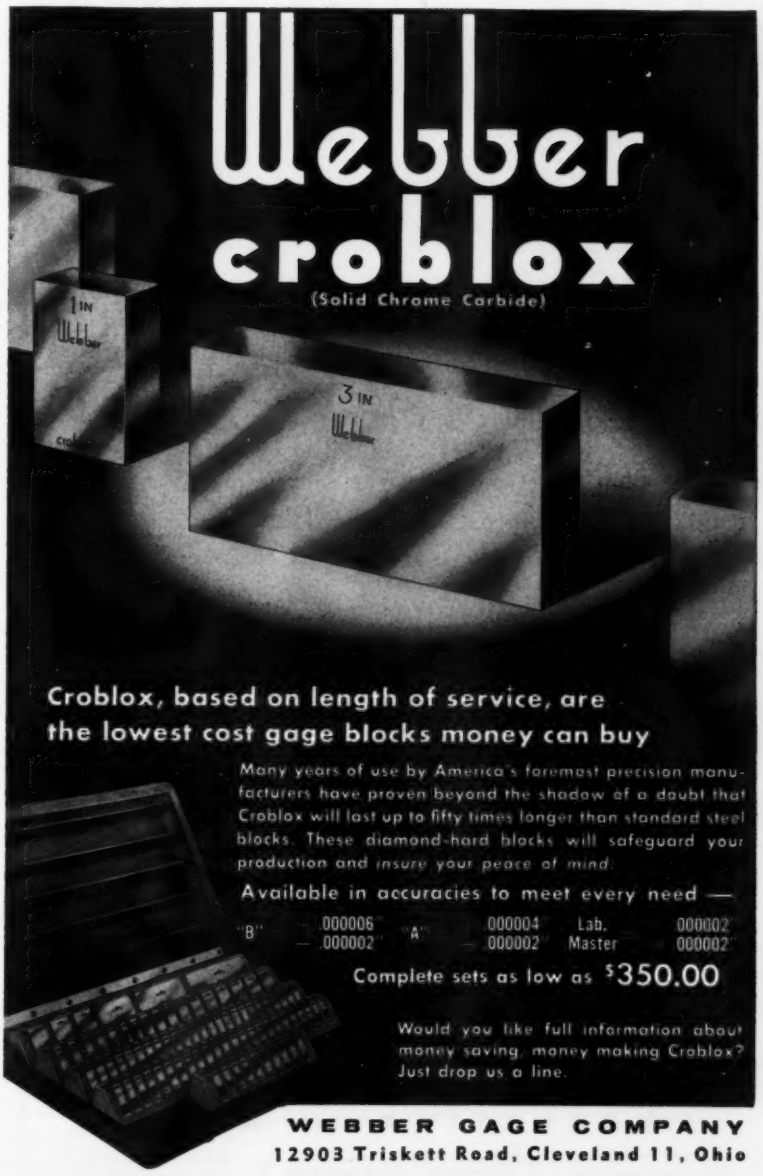
being machined to extremely close tolerances. The chuck is made up of a chuck body with multiple pinch jaw units and three self-centering master jaws. The Cushman Chuck Co., Hartford, Conn., or —
Circle Inform-A-Gram No. A46.

Grip and Handle Sheet Metal and Plastic Parts with a press unloader unit utilizing vacuum. The Vac-Hand gripping mechanism can be mounted on standard PAS straight-line press unloaders for the auto-

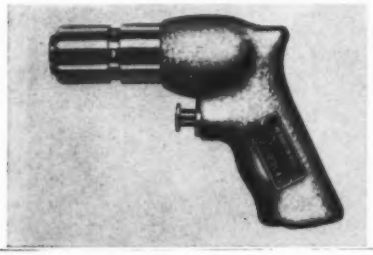
matic handling of sheet metal parts in stamping presses, as well as parts in plastic molding machines. The unit operates on 45 psi line pressure. Press Automation Systems, Inc., 25418 Ryan Rd., Centerline, Mich., or —
Circle Inform-A-Gram No. A47.

Operational Ease and Speed are features of Model 94 electric clutch hand turret lathe. Pushbutton operation provides a range of infinite spindle speeds with 140 to 3500 rpm. The standard constant speed motor powers this range without reversals or change of speeds by the motor itself. The self-centering bed of rigid construction insures permanent accuracy and high finish on the work. The Wade Tool Co., Waltham, Mass., or —
Circle Inform-A-Gram No. A48.




Webber
croblox
(Solid Chrome Carbide)
1 IN
3 IN
Croblox, based on length of service, are the lowest cost gage blocks money can buy
Many years of use by America's foremost precision manufacturers have proven beyond the shadow of a doubt that Croblox will last up to fifty times longer than standard steel blocks. These diamond-hard blocks will safeguard your production and insure your peace of mind.
Available in accuracies to meet every need —
"B" .000006 — .000002" "A" .000004 — .000002" Lab. Master .000002" .000002"
Complete sets as low as $350.00
Would you like full information about money saving, money making Croblox? Just drop us a line.
WEBBER GAGE COMPANY
12903 Triskett Road, Cleveland 11, Ohio
LARGEST EXCLUSIVE MANUFACTURERS OF PRECISION GAGE BLOCKS

24 Different Tools for scaling, chiseling, peening, metal cutting, star drilling, etc. are available for use with a new light weight air hammer. The Bantam Bully air hammer

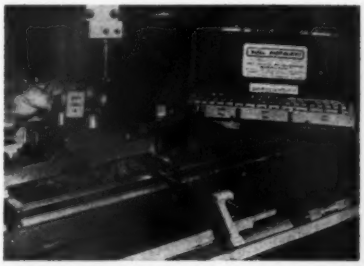


weighing 20 oz, uses 6.5 cfm at 90 psi. A metering trigger controls blows/min from 0 to 13,000. The air hammer can be operated easily with one hand, leaving the other free to handle the work. Superior Pneumatic and Mfg., Inc., 4758 Warner Rd., Cleveland 25, or —
Circle Inform-A-Gram No. A49.

Fast, Precision Grinding, Polishing, and Burring are performed by the portable No. 2 Moto-Tool that produces 27,000 rpm. It gets into places impossible to reach with larger tools. The Moto-Tool is especially useful for finish grinding dies and molds,

marking tools, and burring small parts. Dremel Mfg. Co., 2400 - 18th St., Racine, Wis., or —
Circle Inform-A-Gram No. A50.

Designed for Everyday Shop Measurement Applications are the Shop-Blocks produced by The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. They are acurate to +0.000006" and −0.000002" from the actual size engraved on each gage block. Flatness

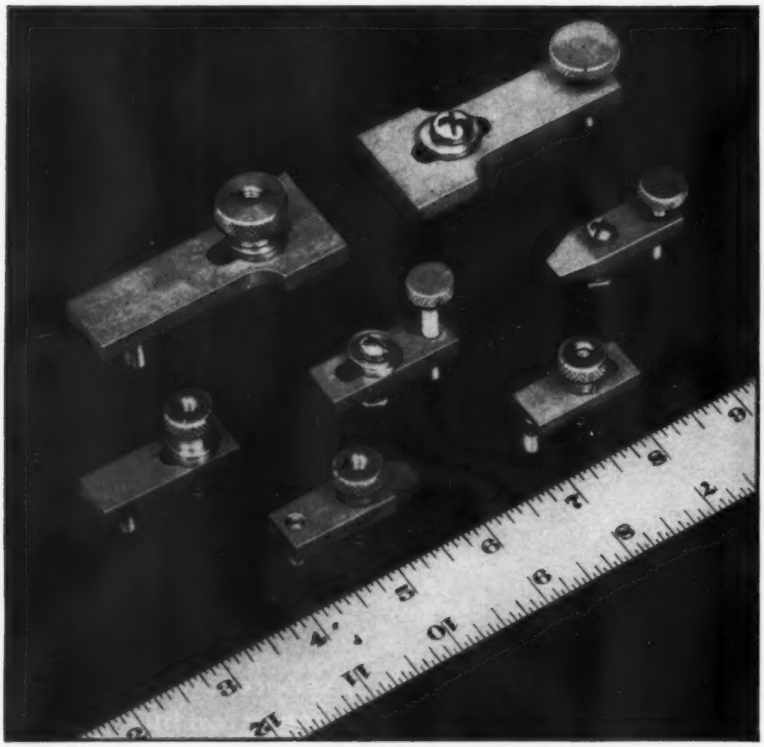


and parallelism is held within 0.000004". Two sets are available. They can be used for machine setups, gaging at the machine, in the production line, and at the assembly bench.
Circle Inform-A-Gram No. A51.

Diabase (Black Granite) Surface Plates, angles, and parallels have been added to the equipment line produced by Machine Products Corp., 6771 E. McNichols Rd., Detroit 12. The granite plates assure freedom

from rust or any other chemical alteration, lower response to temperature fluctuations, and lower coefficient of thermal expansion. In addition, they are more resistant to wear and easier on tools.
Circle Inform-A-Gram No. A52.

LODDING'S LITTLE FELLOWS



The Lodding line of stainless steel fixture components and clamp assemblies is complete and ready for you at your nearest Lodding warehouse. Carefully designed and made for essential holding in miniature operations . . .

- **Chisel Point Assembly . . .**
- **Wide Clamp Assembly . . .**
- **Knob Assembly . . .**
- **Thumb Screw Assembly . . .**

LODDING, INC.
WORCESTER 1, MASS.

Precision Tool Sales
417 E. Florence Ave.
Los Angeles 3, Calif.

FACTORY WAREHOUSES

Bagby Engineering Co.
1047 Forest Ave.
Evanston, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 180

"HILLCO" TANGENT CHASERS

The new line of "HILLCO" Tangent Chasers, which can be re-ground for 80% of their original length, are guaranteed to be of highest grade tool steels ground to exacting tolerances. We feel that this complete line of chasers are the finest that we have produced in our 75 years of cutting tool manufacture. We think that you will agree with us.

THE HILL ACME COMPANY
ACME MACHINERY DIVISION
1203 West 65th Street • Cleveland 2, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1811

Here's *NEW Speed and Economy* in HOLE SIZING and FINISHING!

BALLIZING is a high-speed, high-precision process for sizing and finishing holes—simply by pressing a suitably-oversize ball through the unfinished hole. It is used to advantage with holes from 1/16" to 5" diameter, in a wide range of metals—with production quantities from 1 piece to millions.

Rod (not shown) pushes ball through unfinished hole.

Precision ball of tungsten carbide, slightly larger than finished hole.

Hole before ballizing.

ADVANTAGES:

- FAST. Takes only seconds. Well suited to automation.
- ACCURATE. Produces uniform hole size.
- FINE FINISH—burnished smooth.
- ECONOMICAL. Replaces one or more machining, grinding or finishing operations. Uses unskilled labor. No tool sharpening. No close adjustments. No special or high-precision equipment required.

FREE BALLIZING BULLETIN gives details; shows typical applications. May we send you a copy?

INDUSTRIAL TECTONICS, Inc.
3694 Jackson Rd., Ann Arbor, Michigan
18326 Santa Fe Ave., Compton, California

PRECISION BALLS OF ANY SIZE OR MATERIAL
ANTI-FRICTION BEARINGS FOR SPECIAL REQUIREMENTS
TOOLING BALLS — MASTER BALLS — SPHERICAL FINISHING

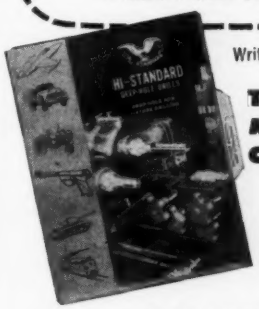
CIRCLE INFORM-A-GRAM KEY NO. 1812

DRILLING COSTS TOO HIGH?

In Steel . . . Stainless . . . Brass . . .
Aluminum . . . Titanium . . . and Wood

HI-STANDARD Deep-Hole Drills give you . . . at lower cost . . .

- **Exacting Hole Diameters**
- **Unlimited Hole Depth**
- **Exceptional Hole Concentricity Throughout**
- **Improved Hole Surface Finish**
- **More Pieces Between Grinds**



Write For Engineering File "C"

THE HIGH STANDARD MANUFACTURING CORPORATION
Hamden, Connecticut

Pioneers and Makers of Deep-Hole Drills For More Than 30 Years

CIRCLE INFORM-A-GRAM KEY NO. 1813

Face Milling Cutters

- Unique blade, shoe and wedge positive-locking principle assures perfect alignment, enormous strength and versatility.
- Offer tooth spacing and blade capacity for all conditions.
- Exclusive body design permits use of correct blade for each job and every material.
- HSS and carbide blades available with lead angles up to and including 45°.

Write for Catalog No. 31

LOVEJOY TOOL COMPANY, INC.
146 Main Street, Springfield, Vermont, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1814

Buy THRIFTMASTER

Double Eccentric Adjustable

DRILLHEADS

The only heads of this type standard with

Full Ball Bearing Construction

- greatest flexibility in drilling irregularly spaced holes
- sustained accuracy for trouble-free operation
- 20 Standard Models—3 to 8 Spindles
- Special Models on Order

Makers of
DORMAN AUTOMATIC
REVERSE TAPPERS

Write today for complete information on this *dependable* Double Eccentric Adjustable Drillhead . . . the latest addition to the Thriftmaster line of Single Eccentric Universal Joint Type Adjustable and Special Fixed Center Drillheads.

THRIFTMASTER
Products Corporation
A SUBSIDIARY OF THOMSON INDUSTRIES, INC.

1012 N. Plum St.
LANCASTER, PA.

CIRCLE INFORM-A-GRAM KEY NO. 1821

More per hour with MEAD
WORK FEEDERS

Feed work fast to drill, tap, broach, mill. Delivers, holds, ejects stampings, castings, screw machine parts up to 3"—thousands per hour. Combines with MEAD Timers and Drill Press Feeds for easy, cost-saving automation.

Send for new Air Power catalog today!
(See Thomas' Register for nearest distributor's address, phone number.)

MEAD
SPECIALTIES COMPANY
4114 N. Knox Ave., Dept. HA-77, Chicago 41, Ill.
PATHFINDER IN AIR POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 1823

The Powerful NEW Hi-Torque
HANDEE®
FOR DIE TOUCH-UP WORK

A COMPLETE WORKSHOP IN YOUR HAND

Grinds, polishes, cuts, saws, engraves, cleans and burnishes. Can be used for working in wood, hardened steel, non-ferrous metals, glass, ceramics, etc. A big time-saving tool for light production grinding and touch-up for all shops, tool and die plants, foundries, etc.

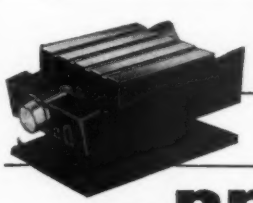
The new Hi-Torque Handee is packed with speed (25,000 r.p.m.) and power. Perfectly balanced, cool running, fits the hand for pencil point precision in delicate work. New chuck lock design for quick change of accessories. Available in 110 or 220 volt, 25 to 60 cycles.

with 6 accessories
$23.95

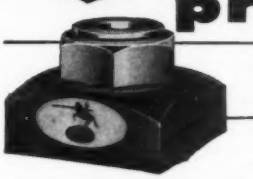
With every type of cutting tool in metal case $32.95

Chicago Wheel & Mfg. Co.
Dept. T-7
1101 West Monroe Street
Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1822



How to keep
precision
in a precision machine



SET YOUR MACHINES LEVEL AND KEEP THEM LEVEL WITH EMPCO LEVELING JACKS

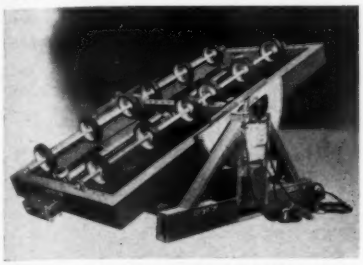
You're paying for precision. *But . . . are you getting it?* Improper leveling and excessive vibration can seriously impair the precision performance you pay for in costly machine tools. *Set* your machines level and *keep* them level with EMPCO Leveling Jacks! EMPCO Jacks provide a solid, smoothly adjustable foundation for machine tools, large surface plates, automation lines, tool room and production equipment of all types. Easily installed, they increase machine efficiency, reduce downtime and maintenance. Periodic releveling is a quick, easy one-man job. Combined with VI-SORB Mounting Pads, EMPCO Jacks control internal and transmitted vibrations, reduce noise and retard machine creepage. Jacks available in six styles, 25 models. Pads cut to fit.

Send Today for Descriptive Bulletin No. 100—
The Enterprise Machine Parts Corporation
2735 Jerome Avenue • Detroit 12, Michigan

EMPCO LEVELING JACKS

CIRCLE INFORM-A-GRAM KEY NO. 1824

Tilting Turning Rolls can be used as plain turning rolls for work of any minimum length and up to 20' long and from 4" up to 6' dia. The welding positioners are manufactured in capacities from 5,000 to 30,000 lbs.

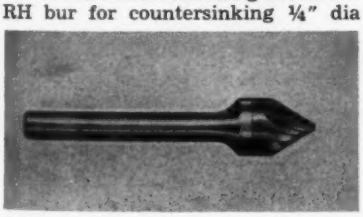


All models are supplied with an accurate protractor to indicate the degree of tilt, and with adjustable triggers to trip the limit switches at any preset degree of tilt. The vessel or tank can be tilted 45° either way from horizontal. Aronson Machine Co., Arcade, N. Y., or —
Circle Inform-A-Gram No. A53.

Accurately Calibrate a Plane Surface with the Planekator. With this instrument all that is required is to take indicator readings between the perfect plane and the surface plate and record the readings on a chart.

No calculations are necessary. The indicator base of the Planekator will take any indicator made to American Gage Design AD2 dimensions. Rahn Granite Surface Plate Co., 638 N. Western Ave., Dayton, O., or —
Circle Inform-A-Gram No. A54.

A Countersink Type Solid Carbide Bur, incorporating right-hand spiral flute, has been announced by The Atrax Co., Newington, Conn. Tests have been conducted using the M-141 RH bur for countersinking ¼" dia

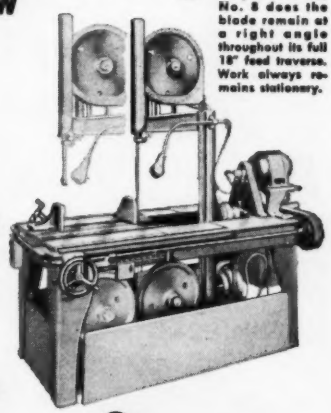


holes in hardened die steel Rockwell C 62-63. The bur features positive shearing action and excellent chip ride-out to product a mirror ground finish.
Circle Inform-A-Gram No. A55.

Intricate Contouring — external, internal, and various depths of both types of contouring is performed by the new Hydro-Router. This two spindle tracer controlled machine will accommodate a wide variety of work. A 3-dimensional tracing control can be added to provide a combination of profiling and contouring. Spindle speeds range from 130 to 11,750 rpm. Turchan Follower Machine Co., 26950 Van Born Rd., Box 6055, Dearborn, Mich., or —
Circle Inform-A-Gram No. A56.

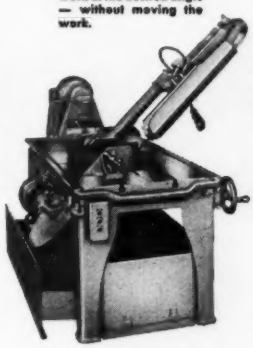
Never Confuse the No. 8 MARVEL with an ordinary Band Saw

...only the MARVEL is Universal



Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.



Only a No. 8 MARVEL can do all of these things: Snip-off a ½" rod or cut-off an 18" x 18" cross section.

Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams

Slotting

Only on a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

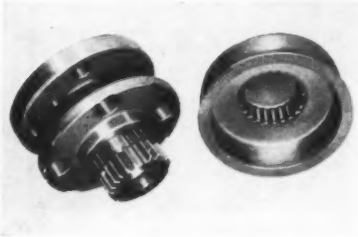
If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

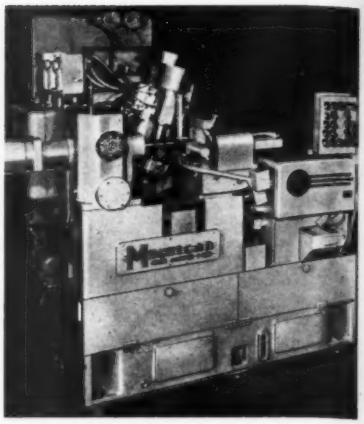
ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 183

The Tork-Lok Spline Arbor has been produced by N. A. Woodworth Co., 1300 E. 9 Mile Rd., Detroit 20. This tool with interchangeable collet for splined parts is used for grinding the O.D. and flanged face true to the pitch diameter of a coupling housing. The collet locates on the pitch diameter of the spline assuring concentricity of 0.0005 TIR. The tool can also handle other special applications.
Circle Inform-A-Gram No. A57.



An Ultra-Speed Hobber has been developed by Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12. Model 1433 uses a common base with built-in parts conveyor for easy tandem setup. Gear washers and gear classifiers can be easily integrated into the machine units. Automatic size control is also provided. The machine will hob up to 12-pitch spur or helical gears. Hobs revolve at variably selected speeds up to 500 rpm.
Circle Inform-A-Gram No. A58.



Precision Built for...

HIGH SPEED PRODUCTION TAPPING

WISCONSIN
Lead Screw Tapping Units and Tapping Heads

Model TU-415 Automatic Lead Screw Tapping Unit

Model L.A. 2-Spindle Tapping Head

This unit is regularly furnished with a flanged quill and slotted spindle for close coupled, multiple spindle, precision tapping heads. For single spindle tapping, it can be furnished without the quill flange, and with an A.S.A. 1" dia. adjustable adapter for a No. 1, 2 or 3 Morse taper.

WISCONSIN builds Adjustable and Fixed Spindle Drill Heads and Tapping Heads, Lead Screw Tapping Units, Special Machines, Fixtures, Fixture Bases and Index Tables.

Write for Illustrated Literature

WISCONSIN DRILL HEAD CO.

4975 N. 124TH STREET • BUTLER, WISCONSIN

A7-9187

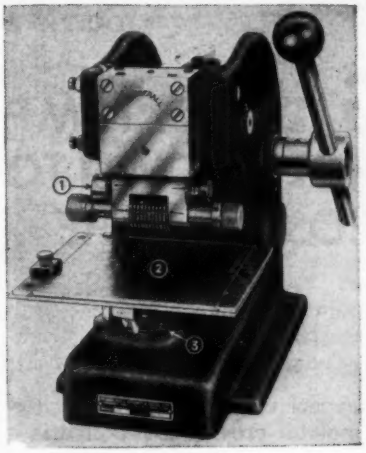
CIRCLE INFORM-A-GRAM KEY NO. 184

Three New Deep Throat Presses rated at 10 tons each have been introduced by Benchmaster Mfg. Co., 1835 W. Rosecrans, Gardena, Calif. Three shut heights are available, measuring 7¾", 10¾", and 13¾". Standard strokes are 1¼", and other strokes of 1½", 2", 2½", and 3" can be had. The presses operate at 180-190 strokes/min. The throat depth is 12" in all models.
Circle Inform-A-Gram No. A59.

19 Engineering Improvements are incorporated in a new series of Silver Line portable electric screwdriver-nutsetter tools introduced by Thor Power Tool Co., Dept., EB, Prudential Plaza, Chicago 1. Featuring size and weight reductions up to 25%, the EB Series offers 100% more power than the UL Series, which they replace. They are in the No. 10 screw or nut capacity class. The tools are available in speeds of 500, 1000, 1500, and 2500 rpm.
Circle Inform-A-Gram No. A60.

NEW BENCH NUMBERING PRESS

MODEL 136



This new small, light, compact Press was designed for stamping small Name Plates and small flat articles with up to ⅛" high characters.

It weighs only 65 lbs. yet has the power and strength of a press much larger in size.

Its compactness, and small size, combined with its power, should be very welcome where saving of valuable space and leaving larger power presses free for other work is of importance.

The model 136 is hand operated, using a cam to obtain pressure. The fact that this press has only three moving parts makes it extremely easy to maintain.

Any Numbering Machine, automatic or non-automatic, Typeholders with interchangeable Steel Type, or Special Dies can be operated in this Press.

Write for bulletin TP-136

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1851

NEW!

NOBURMATIC "H"

A Positive Action, Completely Automatic Tool for DEBURRING and CHAMFERING of FRONT and BACK SIDES of HOLES from a Single Entry!!

Designed for mechanized or automated machine tools but equally adaptable to manual usage in conventional drill presses.

Write for Complete Details!!

NOBUR MFG. CO.
6860 Farmdale Ave., No. Hollywood, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1852

Remove Broken Taps
WITHOUT WASTING
Costly Production Time

That unexpected, stubbornly-held broken tap can cause exasperating delays in production, add unnecessary cost to the job, and shrink profits.

WALTON TAP EXTRACTORS

REMOVE BROKEN TAPS QUICKLY • EASILY • INEXPENSIVELY

2, 3, 4, 5, 6, Flute Styles.
In Sizes
No. 4 to 1½"

The majority of broken taps *can easily* be removed with Walton's simple, specialized hand tools. No expensive machines needed. They will not damage threads or the work.

Why not take advantage of Walton's *30-day free trial offer* to prove to yourself right in your shop that the high labor cost of tap breakage can be reduced. Write for descriptive Data Folder No. 38 giving complete details.

The WALTON Company
HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1853

LAYOUT FLUID

IDEAL FOR TOOLMAKERS & MACHINISTS

TRIAL OFFER

Send me my order of D-R LAYOUT FLUID right away! Bill me ☐ Bill my company ☐
Name_____
Company Name_____
Address_____
City_____ Zone_____ State_____

2 FOUR OZ. "BRUSH-IN-CAP" CANS

$1.00

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1854

ANCHOR BUSHING DRILL TEMPLATES HOLD DOWN TOOLING COSTS ON THE *Ag-2*

Manufacturing costs are closely watched on Transland Company's new, production designed Ag-2 agricultural and forestry airplane.

Inexpensive, lightweight, Anchor Bushing drill templates provide low cost drill tooling for the complete interchangeability of parts for production and spares for the Ag-2's service program.

Photo shows an easy-to-make Anchor Bushing drill template being used to locate and drill holes for Blind Nuts in the six fuel and liquid wing tank bays and matching holes in interchangeable tank covers.

Write for the Anchor Bushing Catalog for descriptions of Anchor Bushings and shop proven methods for making low cost sheet metal and plastic drill tooling.

STANDARD TYPE FOR SHEET METAL TEMPLATES

CIRCLE TYPE FOR LAMINATE PLASTIC TEMPLATES

U. S. PATENT 2483686
FOREIGN PATENTS PENDING
TRADEMARK REGISTERED

hi-shear RIVET TOOL COMPANY
2600 WEST 247TH STREET • TORRANCE, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1861

The New SCHERR MICRO-PROJECTOR with the VERTICAL design

NEW 1957 SELF CONTAINED IMPROVED MODEL FEATURING

- ✓RIGID FLOOR BASE – ELIMINATING EXTRA CHARGE FOR TABLE
- ✓TILTING STAGE FOR HELIX, ANGLES AND BEVELS
- ✓4" DIA. STAGE OPENING
- ✓14" DIAMETER SCREEN
- ✓COLUMN SLIDE ADJUSTABLE FOR WEAR BY MEANS OF GIBS – WILL HOLD SQUARE INDEFINITELY.
- ✓CUSTOM MADE PRECISION COATED LENSES & DOUBLE CONDENSERS FOR DIFFERENT OBJECTIVES 10 TO 100X MAGNIFICATION.
- ✓AN ENTIRELY NEW PRACTICAL DESIGNED TOOL FOR INSPECTION DEPARTMENT AND PRODUCTION SHOP.

WRITE FOR ILLUSTRATED FOLDER

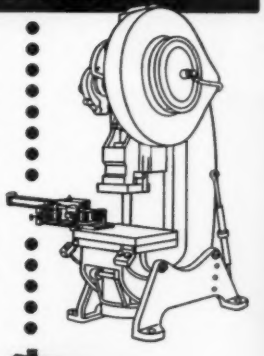
GEO. SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200T LAFAYETTE STREET • NEW YORK 12, N. Y.

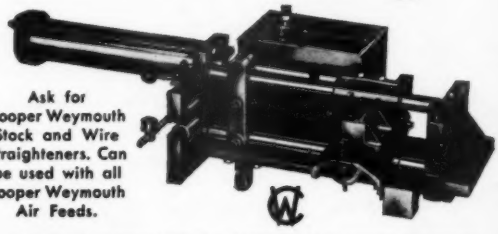
CIRCLE INFORM-A-GRAM KEY NO. 1862

COOPER WEYMOUTH AIR OPERATED SLIDE FEEDS

Boost Power Press Production

Specifically designed to solve the automatic feeding problems in press rooms. Simplified, open throat construction. Air operated from standard shop lines. Easily set up and adjusted at the front, rear or sides of press for accurate long or short runs. Cooper Weymouth Air Feeds, made in five sizes, will feed lengths up to 36", of stock up to 18" in width. They are readily adaptable to material of irregular cross section and ideal for use with hydraulic presses.





Ask for Cooper Weymouth Stock and Wire Straighteners. Can be used with all Cooper Weymouth Air Feeds.

SEND FOR INFORMATION ON THESE AND OTHER PRODUCTS

COOPER WEYMOUTH, INC.
600 HONEYSPOT ROAD, STRATFORD, CONN.

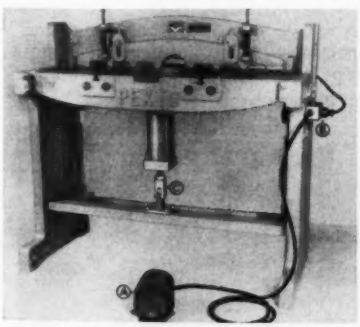
CIRCLE INFORM-A-GRAM KEY NO. 1863

Set Up Routine Programs of Seeking Out Vibrations and establishing acceptable tolerances with a portable vibration amplitude meter. Model 305 can be used in even the most inaccessible places. Its applications

include inspection, production, and preventive maintenance. International Research & Development Corp., 797 Thomas Lane, Columbus, O., or —
Circle Inform-A-Gram No. A61.

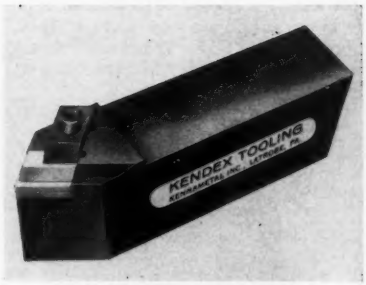
Accurately Accumulate Data on the Operation of Machines, processes or systems with the Recorder+ Totalizer. Model SR eliminates the need for constant observation and provides a continuous recording. The continuous sprocket drive strip chart maintains positive, accurate timing. Standard Instrument Corp., 657 Broadway, New York 12, or —
Circle Inform-A-Gram No. A62.

A New Trippit Power Kit for Foot-Operated Shears is now available from General Automation Corp., 100 West End Ave., New York. Illustrated is Model P-137 for three-foot shears, but other models are also



available for different sizes. The power kit converts shears to safe, positive electro-air operation, increasing production. A completely enclosed electric foot pedal protects against accidental tripping.
Circle Inform-A-Gram No. A63.

A New Throw-Away Insert Profiling Tool for contouring machines, handling both roughing and finishing cuts, has been developed by Kennametal Inc., Latrobe, Pa. Designed to prevent the insert from shifting, a rigid support and clamp hold the insert in proper cutting position when the direction of cutting forces changes as in plunge or face-out cuts. Inserts have two indexable cutting edges with a positive rake angle that minimizes tool pressures and assures accurate duplication of shapes. **Circle Inform-A-Gram No. A64.**



J&L

COLLAPSIBLE TAPS

Lop off expense of inventory because:

- Only one tap with five extra bodies gives a range of 1 5/16" to 3 1/2"
- All shanks are interchangeable
- They can be used either as stationary or rotary types

Changeover time — less than 10 minutes

For full information on J&L Thread Tool Products . . .

Automatic Opening Die Heads & Chasers
Automatic Opening Collapsible Taps
Solid Adjustable Taps
Automatic Opening Stud Setters
Modern-Magic Chucks & Collets
A Complete Line of Accessories

. . . send for this free book

JONES & LAMSON

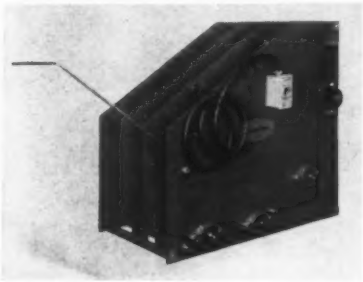
JONES & LAMSON MACHINE COMPANY, 510 Clinton St., Springfield, Vt., U.S.A.

Class III Guaranteed Not Sometimes, but Everytime!

J&L THREAD TOOL DIV.

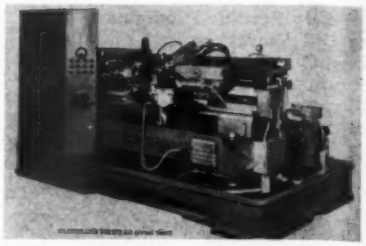
CIRCLE INFORM-A-GRAM KEY NO. 187

Redesigned Model 1010 Coil Cradle has been announced by Durant Tool Supply Co., 1-15 Thurbers Ave., Providence 5, R. I. It has three power driven rolls plus two idling rolls to give complete support to coils of all diameters. The cradle has two centrailizing plates so that the coil is always in direct line with the power press and the roll feed. It is not necessary to move the cradle for aligning the material.



Circle Inform-A-Gram No. A65.

Duplicate from Flat or Round Templates or from the sample part with an electrically controlled, hydraulically actuated profile lathe. It permits full utilization of carbide and ceramic tools, allowing spindle speeds to 5000 rpm. While ideal for large repetitive production runs, the quick-setup and changeover features provide versatility and economy for small quantities. Cleveland Hobbing Machine Co., 1311 Chardon Rd., Cleveland 17, or —



Circle Inform-A-Gram No. A66.

WORLD'S BEST VALUES

STARRETT RADIAL DRILLS

For . . . MAXIMUM EFFICIENCY LONGER LIFE

SIZES: 2½' to 6' with 10", 12½" & 14½" columns. Ground nickel-chrome steel gears. Safety feed. Preselector depth control. Automatic lubrication. from $1995. to $6985.

No. 5 Morse Taper with centralized electro-mechanical clamping device

MODEL P.S. 34"/61" UNIVERSAL SLIDING BED GAP LATHE $12,990

IMPERIAL LATHES

FLAME HARDENED, GROUND BED WAYS. HEAT-TREATED, HARDENED GEARS THROUGHOUT. SUPER PRECISION, ROLLER SPINDLE BEARINGS. EXTREMELY HEAVY CARRIAGE. AUTOMATIC LUBRICATION.

Available sizes from 12" to 67" swing, priced from $1,298 for 12" to $19,490 for 67".

Slightly higher on west coast.

MODEL M.P. 24"/35" swing $7,985

RENTAL PLANS, LIBERAL TERMS

instantaneous "preselector" for speed control

AARON MACHINERY CO., INC.

Dept. "P" 45 Crosby Street New York 12, N. Y. WAlker 5-F300

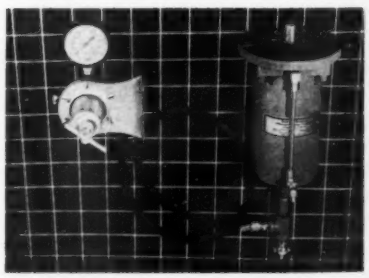
Branches at: Buffalo, N. Y., Mineola, N. Y., Los Angeles, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 188

Precision Threading of Small Diameter Workpieces is performed by a single spindle threading machine. The 5C Landmaco will produce threads to Class 3 and 4 tolerances on a production basis and has a No. 4 to ⅝" range. It can be furnished with or without lead screw feed. Eight spindle speeds ranging from 150 to 1000 rpm are provided. Landis Machine Co., Waynesboro, Pa., or —

Circle Inform-A-Gram No. A67.

Easily Installed on Any Press Application by drilling and tapping one hole either in the bolster plate or die shoe is improved Model RD pneumatic die cushion of all-steel construction. The die cushion equipment is furnished with a combination regulating valve and pressure gage and necessary fittings. The die cushion is made in six sizes from 2" to 6". Dayton Rogers Mfg. Co., Minneapolis. 7, or — **Circle No. A68.**



WIPING MATERIAL COSTS GREATLY REDUCED

Wiping-material costs have been reduced 42% at the SKF Industries, Inc. through the use of Scott Wipers.

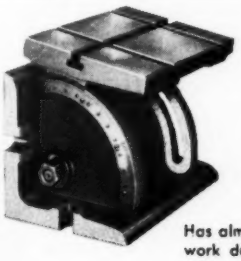
One of the wiping applications at SKF is removing oil from outer races of cylindrical roller bearings prior to inspection. Surfaces of Scott wipers are contoured by a unique embossing process developed by the company. This design feature gives the wiper thousands of tiny pockets that quickly absorb oil, moisture and other contaminants from the bearings.

NECROLOGY

William LaCoste Neilson, 78, vice president and former director of Norton Company, died Mar. 5 in New York City.

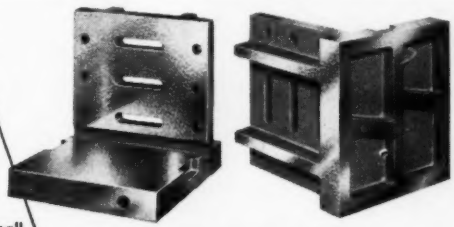
John E. Seltzer, 55, manager of purchases and production planning, Jack and Heintz, Inc., Cleveland, died unexpectedly May 14 of a heart attack.

Joseph B. Armitage, 76, consultant-vice president at Kearney & Trecker Corp. since 1955, died May 30. He joined the company in 1920 as chief engineer and was elected vice president in charge of engineering in 1943.



Toolmaker's Adjustable Knee

Has almost 1001 uses for mounting small work during inspection, layout and machining. Low price, extreme accuracy: sides and face square to within .0001". Angular setting to within 5 minutes by Vernier Scale, 30 seconds by use of built-in sine studs.



Multiplex Angle Irons

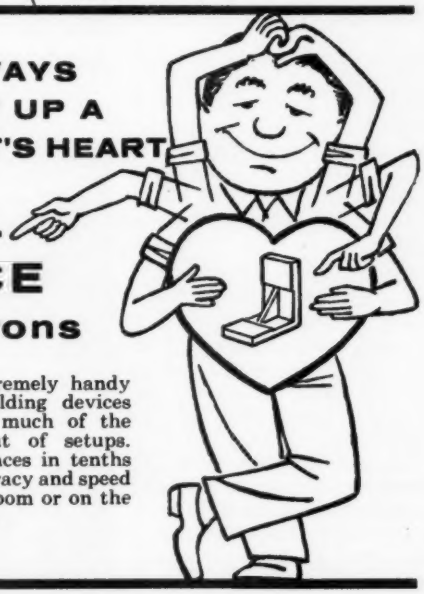
Save time by permitting a single setup of workpiece for many machining and inspection operations. All working surfaces scraped square within .0005" in 6", parallel within .0005".

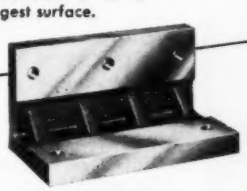
Universal Right Angle Iron

Finish ground on all working surfaces, sides and ends ground square and parallel to within .0002". Can be set on any side or end. Four sizes: 5" to 16" on largest surface.

6 WAYS TO SET UP A MACHINIST'S HEART ... WITH TAFT-PEIRCE Angle Irons

Here is an extremely handy line of workholding devices that can take much of the "trickiness" out of setups. You get tolerances in tenths to increase accuracy and speed — in the tool room or on the production line.



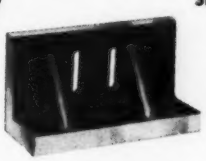


Duplex Angle Irons

Finished inner pads increase accuracy, speed setup work on planers, boring mills, shapers and drill presses. Inner pads parallel to sides within .0005". Outer faces square within .0005" in 6".

Measuring Irons

Provide a fixed surface for measurements. Narrow width makes it convenient for clamping work on the machine table. Front face and bottom finished square within .0002" per foot.



Slotted Angle Irons

Eight different sizes to give variety of combinations of height and width to handle diversity of work. Working faces ground square to within .0005" in 6". Special sizes and hand scraped surfaces on request.

Stock the complete line.
Send for listing of all models with prices.

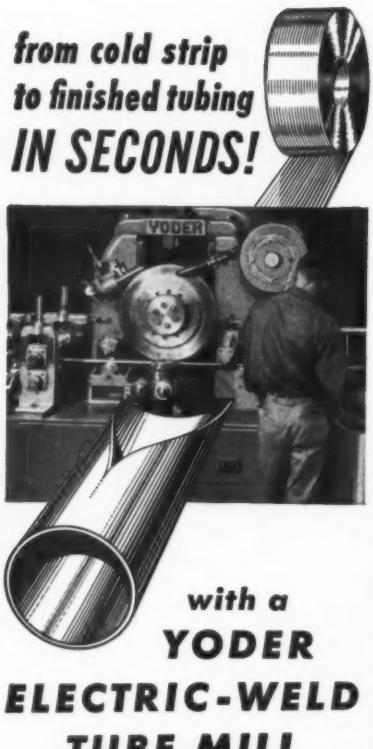
For everything in precision toolroom specialties

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

means TOP precision

from cold strip to finished tubing IN SECONDS!



with a YODER ELECTRIC-WELD TUBE MILL

One of the fastest . . . and one of the least expensive . . . methods of making steel tubing is with a Yoder Electric-Weld Tube Mill. The Yoder method eliminates the need for time-consuming heat treatments and costly conditioning furnaces for most tube needs. Scrap losses, too, are far lower than any other method . . . usually less than 2%.

The Yoder Type-M Mill shown above is operated by one man and a helper. Coiled strip on this mill is continuously cold-roll formed, welded and cut to required lengths in a matter of seconds . . . at speeds up to 340 f.p.m. The quality of the resulting tube is *constantly* better than the requirements of commercial standards. This is one of many reasons why manufacturers and users of tubing the world over are using more Yoder mills than all other makes combined.

If your business requires pipe and tubing, ferrous or non-ferrous, in sizes from ¼-inch up to 26-inch diameter, Yoder can supply the engineering service and machines to produce it faster and better for less! For complete details, write for the Yoder Tube Mill Manual. It's yours for the asking.

THE YODER COMPANY
5501 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING **PIPE AND TUBE MILLS** (ferrous or non-ferrous)

CIRCLE INFORM-A-GRAM KEY NO. 1901

KENCO 15-TON PUNCH PRESSES

MODEL 15

Rugged . . . designed for high precision, steady production

Here's the strongest press possible to build, regardless of weight. Multiple-rib frame is a rigid Sorbomat casting—75% stronger than any comparable frame. Massive, trouble-free crankshaft is one-piece, alloy steel for maximum strength . . . oversize driving mechanism engineered to prevent breakdown. Entire press is built to hold repairs and maintenance to a new low.

Model 15-R—15-ton deep-throat, Rigid-Rib

Same construction features as Model 15 above, but with 15" throat. Negligible deflection at full-capacity punching.

Kenco presses—14 models—2 to 15 tons
Write for literature

KENCO MANUFACTURING CO.
5211 Telegraph Road, Los Angeles 22, California

CIRCLE INFORM-A-GRAM KEY NO. 1902

Our Case History M-101

PROBLEM: To route out casting flash and to de-burr center areas of carpenter's aluminum level.

FORMER METHOD: Hand filing.

PRECISE METHOD: One PRECISE Super 40 Grinder Miller mounted in inverted position under work bench, with T.C. Midget Mill projecting above work surface.

RESULT: A much better, smoother finish and actual cost reduction of 44%!

PRECISE GRINDER MILLERS
Modern Industry's Most Versatile Power Tool

Only PRECISE offers all these features:

Super Speeds up to 45,000 RPM.

Powerful ¼ H.P. output at precision ground and honed collet chuck, up to ¼" size.

Strong, one-piece aluminum alloy housing, precision machined on inside and outside.

Suited for hand grinding and milling as for mounted applications on standard machine tools.

Complete line of machine tool mounts and accessories available.

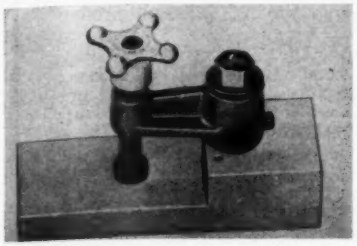
Send for Free Catalog containing our complete line of Grinder Millers and Power Quills from ⅛ to 1½ H.P. and their amazing adaptability to modern day precision production.

Precise

PRECISE PRODUCTS CORP.
3741 Blue River Road • Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 1903

Hold Down Work To Be Drilled or Milled with a revolving clamp assembly incorporating a detachable spring lock revolving shoe on a knob screw for positive workholding on uneven



clamp down. It will operate with either right or left hand swing by optional location of stock. The clamp assembly is available in three sizes — 1½", 3", and 4". Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, or —
Circle Inform-A-Gram No. A69.

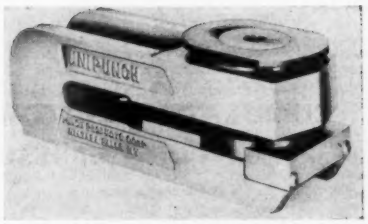
A Signal Light Attachment is a feature of an electric limit contact gage. It reports accurately within 20 millionths of an inch over and under-

size as well as correct size by flashing of green, red, or yellow light. The comparator comes in two types, with and without dial. George Scherr Co., Inc., 200 Lafayette St., New York 12, or—**Circle Inform-A-Gram No. A70.**

Designed for Easy Mounting on workholding fixtures or assembly jigs is a low-cost precision borer. Compact Model S-6 Hydro-Borer is ideal for special installations where space

is limited. It is capable of boring within a tolerance of 0.0003" and producing a finish of 30 microinches or better. Rate of feed is variable in two ranges. Greenlee Bros. & Co., Rockford, Ill., or —
Circle Inform-A-Gram No. A71.

Punch Round and Shaped Holes up to 3½" dia in mild steel up to ⅛" thick with a new unitized hole-punching unit. Unipunch Series B-5 perforating unit, the largest in the company's line, has a 5" wide holder made of lightweight aluminum alloy casting with a steel insert in the guide hole. Since it has a standard shut and die height, it can be used in the same setups with smaller capacity Unipunch units for straight line and staggered hole punching patterns.



Punch Products Corp., 3800 Highland Ave., Niagara Falls, or —
Circle Inform-A-Gram No. A72.

REDUCE
Precision Hole Grinding Costs
USING AN
Onsrud®
D1-S
HOLE GRINDER
MOUNTED ON YOUR

¼ HP 50,000 RPM AIR TURBINE GRINDER
•
SLIDE ADJUSTS TO 0.0001"

Grind precision holes at amazingly low costs with the D1-S . . . using your present machine tools. A completely RIGID unit guaranteed not to deflect in its vertical alignment. Grease-shielded, long life bearings. Capacity up to 2¾" diameter with ¾" wheel . . . and up to 4" diameter with adapter. Proper high speed and power for dependable, fast operation with toughest steels.

OR MOUNT ON JIG BORER TO CONVERT MACHINE TO PRECISION JIG GRINDER

ONSRUD MACHINE WORKS, INC.
PORTABLE TOOL DIVISION
3941 PALMER ST., CHICAGO 47, ILL.

WRITE FOR FREE D1-S HOLE GRINDER BULLETIN 1126

CIRCLE INFORM-A-GRAM KEY NO. 191

CUMULATIVE EDITORIAL INDEX FOR 1957 ISSUES

The number of subjects on which T&P's editors present material in just a few issues adds up very rapidly. Most articles are of lasting interest and have future reference value in solving tool and production problems.

This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this new, unique and useful index.

The Publisher

SUBJECT INDEX

Abrasive machining
- Belt grinding of motor rotors, Jan. p. 151 (½ p)
- New techniques in machining methods, Jan. p. 63 (6 pp)

Adhesives
- Epoxy bonding of carbides to steel, Feb. p. 79 (5 pp)

Airfoil, machine for milling, Apr. p. 92 (1½ pp)

Air power
- Air-actuated clamping blocks, Apr. p. 85 (1 p)
- Cylinders, 10 widely held misconceptions of, Apr. p. 132 (2/3 p)
- Multiple gun drilling, air feed, May, p. 105 (3 pp)
- Notebook: Tips on air equipment maintenance, Feb. p. 111 (4 pp)

Apprenticeship
- Dividing skilled groups, Apr. p. 114 (½ p)
- Program building, Jan. p. 11 (3 pp)

Assembly machines, automatic, Apr. p. 89 (3 pp)

Automatic handling
- Basketing workpieces, Feb. p. 119 (½ p)
- Demand-feed distribution system, Jan. p. 77 (1/3 p)
- Shuttle transfer conveyor, Jan. p. 108 (¼ p)
- Storage unit, rotary, Apr. p. 84 (½ p)
- Transfer presses, on, June, p. 87 (13½ pp)

Automation
- Automated control of gear quality, May, p. 91 (6 pp)
- Built-in quality control, May, p. 104 (1 p)
- Capital cost of, June, p. 82 (1 p)
- Color coding to simplify machine changeover, June, p. 75 (2¾ pp)
- In-process Q-C for transfer lines, May, p. 81 (5 pp)
- Magnetic memory system for, Mar. p. 219 (1/3 p)
- Maintenance problems of, June, p. 82 (1 p)
- Myths and fallacies of, Mar. p. 95 (4 pp)
- Standard units for, June, p. 122 (½ p)
- Transfer presses for, June, p. 87 (13½ pp)

Bonuses for supervisors, Feb. p. 148 (1 p)

Boring heads, multi-diameter, Feb. p. 89 (6 pp); Mar. p. 99 (6 pp)

Boring machine, multiple spindle, June, p. 104 (1 p)

Boring tool trouble analysis, Mar. p. 99 (6 pp)

Brazing
- Air clamps for, Apr. p. 85 (1 p)
- Fundamentals for, May, p. 99 (5 pp)
- Induction, ceramic jigs for, June, p. 78 (1 p)

Broaching, external, on automatic screw machine, June, p. 73 (2 pp)

Broaching machine, automated, Jan. p. 154 (½ p)

Carbide
- Bonding with epoxy, Feb. p. 79 (5 pp)
- Boring of multi-diameters, Feb. p. 89 (6 pp); Mar. p. 69 (6 pp)
- Brazing, special fluxes for, Mar. p. 104 (¼ p)
- Dies, hot heading titanium bolts with, Mar. p. 111 (1/3 p)
- Dies produce quality parts, Feb. p. 58 (1 p)
- Grades classified, Feb. p. 95 (4 pp)
- Gun drilling, fixturing for, Mar. p. 79 (4 pp)
- Machining hi-temp alloys with, Feb. p. 73 (6 pp)
- Metallurgy, Feb. p. 95 (4 pp)
- Milling with, Feb. p. 85 (4 pp)
- Multiple gun drilling, May, p. 105 (3 pp)
- Tipped soldering jigs, May, p. 148 (½ p)

Ceramic tooling, discussion of, June, p. 100 (1½ pp)

Coated abrasive machining methods, Jan. p. 63 (6 pp)

Cold forming process, Fellows-Appel, Mar. p. 78 (1 p)

Color coding to simplify machine changeover, June, p. 75 (2¾ pp)

Controls
- Automation magnetic memory system, Mar. p. 219 (1/3 p)
- Electro-hydraulic servo system, Jan. p. 104 (½ p)
- Electro-hydraulic transducer, Feb. p. 105 (5½ pp)
- Numerical, for jig bores, etc. Apr. p. 80 (1 p)
- Numerical, in aircraft industry, Feb. p. 48 (1½ pp)
- Press "non-repeating" system, June, p. 108 (1/3 p)
- Tape, for positioning table, Mar. p. 88 (1 p)
- Tracer, for profile milling, Apr. p. 181 (¾ p)
- Welding, Feb. p. 110 (¾ p)

Coolants
- Abrasive machining, Jan. p. 67 (½ p)
- Gun drilling, for, Mar. p. 79 (4 pp); May, p. 105 (3 pp)
- Inductor bushing for drilling copper, June, p. 79 (3 pp)
- Synthetic, test report on, May, p. 180 (½ p)

Countersink, self-aligning, Jan. p. 94 (1/3 p)

Cutting tools
- Ceramic, pros and cons of, June, p. 100 (1½ pp)
- Form milling cutters, design and application of, Mar. p. 89 (3½ pp)
- Multi-diameter, Feb. p. 89 (6 pp); Mar. p. 99 (6 pp)

Deburring of copper tubing, Jan. p. 78 (1 p)

Deep drawing of molybdenum anodes, June, p. 106 (2 pp)

Design of high production tools, Mar. p. 74 (4 pp)

Dies
- Carbide, hot heading titanium bolts with, Mar. p. 111 (1/3 p)
- Carbide, produce quality parts, Feb. p. 58 (1 p)
- Contour sawing of, Apr. p. 100 (1 p)
- Epoxy-faced, June p. 103 (1 p)

Die sinker, equipped for deep tracing, Feb. p. 105 (5½ pp)

Drilling
- Copper, coolant inductor bushing for, June, p. 79 (3 pp)
- Gun, fixturing for, Mar. p. 79 (4 pp)
- Gun, multiple, air-powered, May, p. 105 (3 pp)
- Machine, deep hole, Jan. p. 51 (1¼ p)
- Variable workpieces, Jan. p. 69 (3 pp)
- Wide range of bolt circle diameters, Apr. p. 109 (1/3 p)

Economics, industrial
- Editors look at '57, Jan. p. 61 (1 p)
- Machine tool outlook for '57, Jan. p. 72 (5-2/3 pp)
- Machine tool sales to hit billion dollars, Jan. p. 156 (½ p)
- Obsolescence of machine tools, June, front cover, (2 pp)
- Tool and die forecast for '57, Jan. p. 156 (3/5 p)

Electrolytic grinding of honeycomb, Apr. p. 185 (1/3 p)

Experimental designs, Apr. p. 119 (5 pp)

Extruding, spray lubrication for, May, p. 149 (¼ p)

Feeds for transfer presses, June, p. 87 (13½ pp)

Form milling cutters, design and application of, Mar. p. 89 (3½ pp)

Gages
- Air-type, for automation quality control, May p. 104 (1 p)
- Maintenance of, May, p. 80 (½ p)

Gaging
- Air, of drill jig bushings, Apr. p. 81 (3½ pp)
- Automatic, for gear dimensional accuracy, May p. 91 (6 pp)
- Electronic system for grinders, Apr. p. 174 (1/3 p)
- In-process quality control equipment, May, p. 81 (5 pp)

Gears, automated control of quality production, May p. 91 (6 pp)

Grinding and finishing
- Abrasive machining methods, Jan. p. 63 (6 pp)
- Belt grinding of motor rotors, Jan. p. 151 (½ p)
- Cylindrical machine for large, light work, Jan. p. 147 (1/3 p)
- Electrolytic, of honeycomb, Apr. p. 185 (1/3 p)
- Fixturing for rotary surface grinder, Apr. p. 73 (5 pp)
- Grinder for heavy stock removal, June, p. 86 (1 p)
- Numerically controlled hole grinder, Apr. p. 80 (1 p)
- Precision, of servo valve components, Apr. p. 88 (1 p)

Grinding, tool
- Form milling cutters, Mar. p. 89 (3½ pp)

Gun drilling
- Fixturing for, Mar. p. 79 (4 pp)
- Multiple, air-powered, May, p. 105 (3 pp)

Heat treating
- Critical quenching speed, Mar. p. 74 (4 pp)
- Rapid quenching with reduced distortion, Jan. p. 78 (3½ pp)

Hydraulics
- Cylinders, 10 widely held misconceptions of, Apr. p. 132 (2/3 p)

Inspection
- 100%, on small motors, May, p. 87 (3½ pp)
- Tools, of, May, p. 18 (1½ pp)

Interferometer-digital counter measuring system, Mar. p. 83 (4½ pp)

Inventory
- In-process, shrinkage of, May, p. 116 (1½ pp)
- Management principles, Jan. p. 83 (4 pp; 12 pp in Nov. and Dec. '56 issues)

Jigs and fixtures
- Drill jig centers variable workpieces, Jan p. 69 (3 pp)
- Fixtures, air, for silver brazing, Apr. p. 85 (1 p)
- Fixtures for gun drilling, Mar. p. 79 (4 pp)
- Fixtures for surface grinding, Apr. p. 73 (5 pp)
- Jigs, ceramic, aid to brazing, June, p. 78 (1 p)
- Plastic, for short runs, Feb. p. 182 (¾ p)
- Tool steels for high production, Mar. p. 74 (4 pp)

Lathe
- Turret, tooling for valve parts, Apr. p. 86 (2 pp)
- Vertical chucking, May, p. 252 (1 p)

Lubricant
- Castor oil, for deep drawing molybdenum, June, p. 106 (2 pp)
- Spray, for extruding, May, p. 149 (¼ p)

Machine tool industry
- Machine tool sales to hit billion, Jan. p. 156 (½ p)
- Obsolescence, June, front cover (2 pp)
- Outlook for '57 by industry leaders, Jan. p. 72 (5-2/3 pp)

Machining (also see specific process)
- Abrasive, belt grinding of motor rotors, Jan. p. 151 (½ p)
- Abrasive, new techniques in machining methods, Jan. p. 63 (6 pp)
- Contour sawing large workpieces, Apr. p. 100 (1 p)
- High temperature alloys with carbides, Feb. p. 73 (6 pp)

Hydraulic valves, machining and testing of, Apr. p. 101 (4 pp)
Profiling, numerically controlled, Feb. p. 48 (1½ pp)
Spark erosion process, May, p. 164 (½ p)
Titanium, a case history of, June, p. 83 (3 pp)
Tracing without templates, Feb. p. 105 (5½ pp)

Maintenance
Automation, problems of, June, p. 82 (1 p)
Gages, May, p. 80 (½ p)
Management for small plants, Apr. p. 9 (2¼ pp)
Preventive, Feb. p. 120 (1-1/3 pp)

Management
Bonuses for supervisors, Feb. p. 148 (1 p)
Mathematical programming for, Apr. p. 94 (6 pp)
Preventive maintenance records, Feb. p. 120 (1-1/3 pp)
Quality assurance and reliability, Mar. p. 12 (2¼ pp)
Role and responsibility in safety programs, Apr. p. 110 (2/3 p)
Safety economics in stamping plants, June, p. 114 (2¼ pp)
Scheduling engineers' activities, Feb. p. 173 (½ p)
The million-dollar lathe, May, p. 77 (1 p)
Time study of punch-press operations, Feb. p. 99 (6 pp)
Training for quality control, May, p. 97 (2¼ pp)

Manpower shortage, 20 ways to ease, Apr. p. 78 (2 pp)

Mathematical programming, a short cut to, Apr. p. 94 (6 pp)

Measurement methods
Fringecount micrometer, Mar. p. 83 (4½ pp)

Metallurgy of carbides, Feb. p. 95 (4 pp)

Methods-time measurement, Feb. p. 99 (6 pp)

Milling
Cutters, form, design and application of, Mar. p. 89 (3½ pp)
Head, hydraulic, Feb. p. 116 (1 p)
Profile, tracer controlled, Apr. p. 181 (¾ p)
Shaping giant airfoils and complex parts, Apr. p. 92 (1½ pp)
With carbides, Feb. p. 85 (4 pp)

Molybdenum anodes, deep drawing of, June, p. 106 (2 pp)

Obsolescence of machine tools, June, front cover (2 pp)

Optical measuring system, Mar. p. 83 (4½ pp)

Patent suits, Mar. p. 110 (1 p)

Personnel management
Bonuses for supervisors, Feb. p. 148 (1 p)
Foreman selection, Mar. p. 57 (1 p); Apr. p. 148 (1-1/3 pp); May, p. 58 (1 p)
Foreman selection, evaluation contamination in, June, p. 57 (1 p)
Hiring new employees, Feb. p. 14 (1 p)
Performance evaluation and foreman selection, May, p. 58 (1 p)
Selection testing, Jan. p. 46 (2/3 p)

Plastic tooling
Epoxy-faced die, June, p. 103 (1 p)
Short run operations, Feb. p. 182 (¾ p)

Presses
"Non-repeating" safety system, Jan. p. 108 (1/3 p)
Productivity, true measurement of, May, p. 116 (1½ pp)
Punch, time study of operations, Feb. p. 99 (6 pp)
Transfer, for automation, June, p. 87 (13½ pp)

Preventive maintenance, usable records, Feb. p. 120 (1-1/3 pp)

Production and inventory control society formed (APICS), Apr. p. 113 (1/3 pp)

Production data automatically recorded, Mar. p. 93 (1¾ pp)

Profile sharpening of milling cutters, Mar. p. 89 (3½ pp)

Quality Control
Assurance and reliability, Mar. p. 12 (2¼ pp)
Automated gear production with, May, p. 91 (6 pp)
Built into automation lines, May, p. 104 (1 p)
Control of surface quality and geometry, May, p. 108 (4 pp)
Peg-board Q-C, May, p. 78 (2½ pp)
Prove it, May, p. 114 (½ p)
Reliability, evolution of, Mar. p. 73 (1 p)
Semi and final assembling small motors by, May, p. 87 (3½ pp)
Tool proofing: a means of, May, p. 18 (1½ pp)
Training for, May, p. 97 (2¼ pp)
Transfer-type special machine tools with, May, p. 81 (5 pp)
Zero center method of, May, p. 78 (2½ pp)

Quenching with reduced distortion, Jan. p. 78 (3½ pp)

Reader participation, Feb. p. 71 (1 p)

Recorder, automatic, of production data, Mar. p. 93 (1¾ pp)

Safety
Does not cost money: it pays money, June, p. 114 (2¼ pp)
Holding employee interest in, Jan. p. 140 (1¼ pp)
Investigating and reporting of industrial accidents, June, p. 102 (2/3 pp)
Programs, management's role and responsibility in, Apr. p. 110 (2/3 p)

Scrap disposal, automatic, Jan. p. 149 (½ p)

Screw-machine
Automatic, external broaching on, June, p. 73 (2 pp)
High speed, holds limits to 0.0005", Apr. p. 93 (1 p)
Plunge thread rolling on, May, p. 86 (1 p)

Small plants, maintenance management of, Apr. p. 9 (2¼ pp)

Special machines (also see "Automation")
Automatic, from standard units, Apr. p. 89 (3 pp)

Standard units for
Automatic machines, June, p. 122 (½ p)
Automatic special machines, Apr. p. 89 (3 pp)
Versatile boring machine, June, p. 104 (1 p)

Steel
Standards, guide to specifying, Feb. p. 126 (1-2/3 pp)
Tool, proper selection of, Mar. p. 74 (4 pp)

Surface quality and geometry, laboratory control of, May, p. 108 (4 pp)

Tape, for positioning table, Mar. p. 88 (1 p)

Titanium, production machining of, June, p. 83 (3 pp)

Tool design and fabrication, Mar. p. 74 (4 pp)

Tools, inspection of, May, p. 18 (1½ pp)

Training, for quality control, May, p. 97 (2¼ pp)

Transfer machine handles 36 different parts, June, p. 75 (2¾ pp)

Transfer presses for automation, June, p. 87 (13½ pp)

Tubing, deburring of copper, Jan. p. 78 (1 p)

VAM: Vogel's approximation method, Apr. p. 94 (6 pp)

Welding
Automatic arc, Jan. p. 82 (½ p)
Controls, Feb. p. 110 (¾ p)
Spatter problem solved, Feb. p. 118 (1 p)

AUTHOR INDEX

Anderlite, E. V.—Carbide Metallurgy Simplified, Feb. p. 95 (4 pp)

Baily, Oliver L. and John M. Morgan—Tracing Without Templates, Feb. p. 105 (5½ pp)

Bicking, Charles A.—Selection of Most Efficient Experimental Designs, Apr. p. 119 (5 pp)

Billings, A. S.—Tool Proofing: A Means of Quality Control, May, p. 18 (1½ pp)

Bregi, Ben F.—Automated Control of Gear Quality, May, p. 91 (6 pp)

Bright, James R.—Myths and Fallacies of Automation, Mar. p. 95 (4 pp); Comparison: Automated and Conventional systems, June, p. 82 (1 p)

Carr, W. L.—A Case History; Production Machining Titanium, June, p. 83 (3 pp)

Cavano, Charles—Safety and Productivity from the Management Side, June, p. 114 2-1/3 pp)

Cote, Norman W.—Multiple Drilling with Air-Fed Gun Drills, May, p. 105 (3 pp)

Dyer, Hugh N.—New Techniques in Coated Abrasive Machining Methods, Jan. p. 63 (6 pp)

Fair, Ernest W.—Holding Employee Interest in the Safety Program, Jan. p. 140 (1¼ pp); Supervisors Need Bonuses Too, Feb. p. 148 (1 p)

Fuller, Almon E.—Grinding Time Slashed By New Fixturing, Apr. p. 73 (5 pp)

Gable, Frank—Multi-Diameter Hole Engineering, Feb. p. 89 (6 pp), Part I; Mar. p. 99 (6 pp), Part II

Goddard, Lewis H. and Fred W. Lucht—40 Pointers for Milling with Carbides, Feb. p. 85 (4 pp)

Gould, Bernard—Try Carbide Bonding with a No-Mix Epoxy, Feb. p. 79 (5 pp)

Gurski, Joseph—Application Guides in Specifying Steels, Feb. p. 126 (1-2/3 pp)

Halliday, W. M.—Drill Jig Automatically Centers Workpieces of Different Sizes, Jan. p. 69 (3 pp)

Hoffman, William E.—Air Tool User's Notebook, Feb. p. 111 (4 pp); The Proper Use of Tool Steel — to Make High Production Tools, Mar. p. 74 (4 pp); Color Cuts Down Time, June, p. 75 (2¾ pp)

Hutchinson, C. E.—Usable Records: Basis of Preventive Maintenance, Feb. p. 120 (1-1/3 pp)

Kramer, Raymond J.—100% Inspection of 12,000 Small Motors Daily, May, p. 79 (3½ pp)

Leipold, John—Fixturing Boosts Gun Drilling into Automatic Production, Mar. p. 79 (4 pp)

Lucht, Fred W. and Lewis H. Goddard—40 Pointers for Milling with Carbides, Feb. p. 85 (4 pp)

Lutz, Robert F.—Rapid Quenching With Reduced Distortion, Jan. p. 79 (3½ pp)

Marsilius, Philip R.—Apprenticeship: Why, Who and How, Jan. p. 11 (3 pp)

Masser, W. J.—Training for Effective Quality Control, May p. 97 (2¼ pp)

Montgomery, William E.—Machining High Temperature Alloys with Carbides, Feb. p. 73 (6 pp)

Morgan, John M. and Oliver L. Baily—Tracing Without Templates, Feb. p. 105 (5½ pp)

Netznik, Frederick P.—Special Automatic Machines from Standard Units, Apr. p. 89 (3 pp)

Norton, Irving H.—Methods-Time Measurement as Applied to Punch-Press Operations, Feb. p. 99 (6 pp)

Nottingham, Ralph B.—Peg-Board Q-C, May, p. 78 (2½ pp)

Oxford, Carl J. Jr.,—Form Milling Cutters—Their Design and Application, Mar. p. 89 (3½ pp)

Paterson, E. G. D.—Observations on Quality Assurance and Reliability, Mar. p. 12 (2¼ pp)

Peden, Douglas T.—Laboratory Control of Surface Quality and Geometry, May p. 108 (4 pp)

Procopio, E. M.—Modern Air Gages Hold the Line on Gaging Costs, Apr. p. 81 (3½ pp)

Raterman, Jerome A.—Galloping Obsolescence, June, front cover, (2 pp)

Reinfeld, Nyles V.—Principles of Inventory Management, Part III—Miscellaneous Inventory Problems, Jan. p. 83 (4 pp); VAM: Vogel's Approximation Method, A Short Cut to Mathematical Programming, Apr. p. 94 (6 pp)

Reuss, Carol E.—20 Ways to Ease the Manpower Squeeze, Apr. p. 78 (2 pp); Q-C? Prove It, May, p. 114 (½ p)

Ritchie, Jack—Plucking Millionths Out of Thin Air, Mar. p. 83 (4½ pp)

Schultheis, C. E.—High Production Machining and Testing of Hydraulic Valves, Apr. p. 101 (4 pp)

Somerwill, William H. and William E. Hoffman—Color Cuts Down Time, June, p. 75 (2¾ pp)

Spencer, Lester F.—For Better Brazing Start With the Fundamentals, May p. 99 (5 pp)

Spencer, Robert L.—The Engineer in Patent Suits, Mar. p. 110 (1 p)

Taylor, Erwin K.—Packages and Panaceas, Jan. p. 46 (2/3 p); Who Hires, Feb. p. 14 (1 p); Repairing the Roof, Mar. p. 57 (1 p); Fishing for Foremen, Apr. p. 148 (1-1/3 pp); Performance Evaluation and Foreman Selection, May, p. 58 (1 p); Evaluation Contamination, June, p. 57 (1 p)

Urbas, Ernest J.—The Transfer Press—An Automatic Factory, June, p. 87 (13½ pp)

Van Raaphorst, C. F.—External Broaching On Automatic Screw Machines, June, p. 73 (2 pp)

Wallin, William C.—Maintenance Management For Small Plants, Apr. p. 9 (2¼ pp)

Weidner, C. B.—Coolant Inductor Bushing Licks Tough Drilling Jobs, June, p. 79 (3 pp)

White, James M.—New Concepts in Deep Drawing Produce Molybdenum Anodes of Higher Reliability, June, p. 106 (2 pp)

Whitehouse, George—Providing In-Process QC For Transfer Lines, May, p. 81 (5 pp)

Wood, K. G.—Numerical Control Potential in the Aircraft Industry, Feb. p. 48 (1½ pp)

UNIQUE DIMPLER WORKS NEW HIGH TEMPERATURE ALLOYS

A new aircraft production dimpling machine and method—"Airflex Camtrol" — is now being manufactured in a floor series, Model C-125, to handle not only the softer alloys but the newest 17-7 PH and 15-7 Mo. stainless steels as well as vanadium and manganese alloys of titanium.

Depending on fastener type and size, dimpling capacities of this new machine are as high as 0.125" in 7075-T6, 0.125" in 8% mn. titanium, 0.120" in 6A1-4V, and 0.120" in 17-7 PH stainless. The machine is versatile beyond modern dimpling uses in that it can spin-impact pierce through 0.150", spin-impact rivet through ⅜" (based on solid mild steel), pneudraulic squeeze rivet, and pierce through 13 ton.

The Airflex Camtrol method, developed by The Lemert Engineering Co., Inc., does not use heat as associated with ram type dimpling. It differs basically beyond cold performance in that it uses high-frequency impacts plus spinning to reform delicate metal structures rapidly and yet by the minute radial stages necessary to prevent shearing. Airflex "Cold-Flow" combines these twin actions under precision controls for force of impact, blows per minute, dimpling time and die hold-down pressures to keep the operation within each alloy's stress factor.

The heart of the new machine's control system is the Camtrol hammer. This unit parallels in some respects the Lemert standard line of Airflex spin-impact riveting hammers for general industry and aircraft. The most significant change is that of the Camtrol high-speed air metering device, from which the dimpler takes its name. This unit permits precise regulation of the reciprocating pneumatic piston both as to stroke and speed.

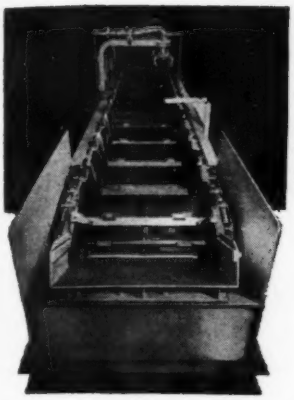
Essentially the dimpler is a special air impact hammer with electrically rotated male die, fed pneudraulically into the sheet from below. Model C-125, is a cabinet machine housing all pneumatic, electric, pneudraulic components with the exception of the yoke cylinder which lowers the combination female die and hold-down pad. Controls for the fully automatic work cycle are accessible, flexible, simple to regulate and few in number, making operation continuous and consistent and eliminating extensive set-up.

The dimpling operation is simplified since no manual prelocation of dies or dwell time is necessary. With the male punch pilot projecting from the working surface of the yoke (inactive position) transfer of sheet from hole to hole is rapid, positive and almost effortless. Dimpling cycles are up to 5 sec for the normal skin thicknesses and somewhat higher for gages beyond.

IN STOCK! AVAILABLE NOW!
54 Different SETS OF
BOKUM BORING TOOLS
You'll find it convenient to have Bokum Boring Tools in sets — containing just the sizes you most frequently use. There are 54 different assortments of tools in stock at all times—packaged in neat, sturdy wooden cases. Combinations can be made up to answer any specific production requirement. Tools are available in both carbide-tipped and high speed steel. Write for catalogs illustrating this extra convenience.
TRADE MARK REG. U. S. PAT. OFF.
BOKUM TOOL CO. INC.
14775 Wildemere Ave.
Detroit 38, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 194

AUTOMATION COMPONENTS



Automation fixture to pre-heat, solder and air cool neck on gas tank.

Ready, at a moments notice, to step into the breach in constructing identical components to any engineering requirements:

- ✓ Economically
- ✓ Accurately
- ✓ On Time

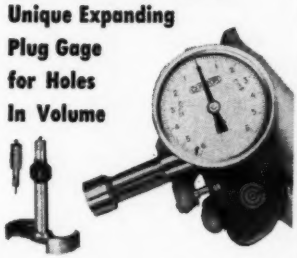
Write for free book titled "Engineering Data"

COMPOSITE FORGINGS, INC.
2300 W. JEFFERSON, DETROIT 16, MICH.
Phone TAshmoo 5-3226

CIRCLE INFORM-A-GRAM KEY NO. 1951

GAGING PROBLEM IN MIND?

Investigate Comtorplug Unique Expanding Plug Gage for Holes In Volume



COMTORPLUG. Interchangeable expanding plugs gage simple or special bores from ⅛" to 10" diameter.

UNIQUE ADVANTAGES

- Large dial with .0001" graduations.
- Indicates actual size, a fixed — not passing — reading.
- Portable — no wire, hoses, stands or electronic gear.
- Positive 2-point gaging — automatic centering.
- Assured accuracy regardless of who operates it.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Will gage work in the machine.
- A shop tool for all-day every day use.

Anybody can use Comtorplug with positive accuracy . . . at machine, bench, lab . . . anywhere, since it's unencumbered by wires, hose, heavy base or electronic gear. The same amplifier fits all plugs and fixed readings show ACTUAL SIZE, front or back tapes, ovality, etc. Whatever problem bore you have in mind, COMTORPLUG may be the answer.

COMTOR COMPANY
82 Farwell St.
WALTHAM 54 MASS.

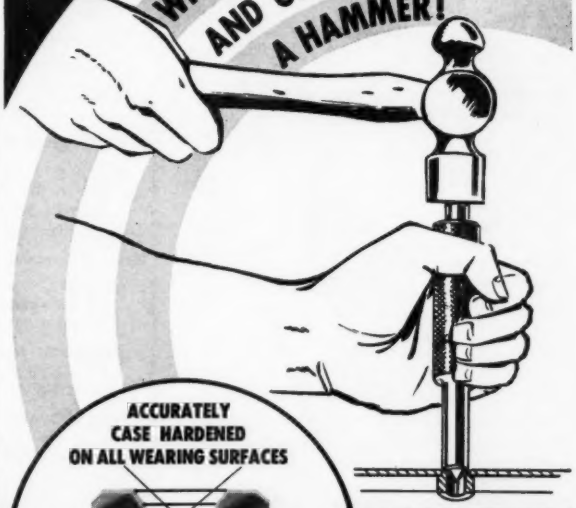
GET THE FACTS — REQUEST BULLETIN 50

CIRCLE INFORM-A-GRAM KEY NO. 1952

REVOLUTIONARY!
CUT TOOLING COSTS WITH NEW!
FLAR-A-LOCK®
TEMPLATE DRILL BUSHINGS
AND WORK LOCATORS

FOR 1/16" OR 1/8" SHEET STEEL OR ALUMINUM

SECURELY INSTALLED WITH ONLY A FLARING TOOL AND ONE IMPACT OF A HAMMER!



- NO SKILL REQUIRED
- QUICK • ACCURATE
- NO RIVETS
- NO PRESSES

ALSO AVAILABLE FOR PLASTIC TOOLING AND ¼" MASONITE BOARD

Write Today For Catalog #102A

TECHNO-PRODUCTS CORP.
143 Netherwood Drive, Springfield, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1953

ADVERTISERS' INDEX

Aaron Machinery 188
Aber Engineering Co.....197
Ace Drill Bushing Co., Inc.....100
Ace Drill Corp.....120
Acme Industrial Co.....114
Acme Tool Co.....128
Advance Products 126, 128
Aget Mfg. Co.....163
Air-Mite Devices, Inc.....155
Alina Corp. 152
Allegheny Ludlum Steel Corp.....167
Allen Mfg. Co.....23
American Chain & Cable Co., Inc.
Allison Div. 168
Wilson Mechanical Inst. Div.....149
American Drill Bushings Co.....200
American Gauge Corp.....8
American Machine & Foundry Co.....174
American Positive Grip Vise Corp.....169
Applied Mechanics Corp.....123
Armstrong-Blum Mfg. Co.....183
Armstrong Bros. Tool Co.....172
Arrow Tool & Reamer Co.....197
Austin Industrial Corp.....129
Automation Devices, Inc.....123
Avildsen Tools & Machines, Inc.....198

Balas Collet Mfg. Co..... 7
Barnes Co., Inc., W. O..... 67
Bausch & Lomb Optical Co..... 52
Bay State Abrasive Products Co..... 14
Bellows Co., The..... 39
Benchmaster Mfg. Co..... 63
Bliss Co., E. W..... 53
Bodine Corp., The..... 47
Boice-Crane Co. .....
Bokum Tool Co.....194
Bryant Chucking Grinder Co.....144, 160
Buckeye Tools Corp..... 35
Bushman Co., H. L.....148

Cadillac Gage Co.....135
Carpenter Steel Co., The.....130
Challenge Machinery Co., The.....126
Chandler Tool Co.....140
Chicago Screw Co.....107
Chicago Wheel & Mfg. Co.....182
Cincinnati Milling Machine Co., The..... 95
Cincinnati Shaper Co.....104
Cleveland Twist Drill Co..... 97
Cogsdill Tool Products.....162
Comet Tool Co.....155
Composite Forgings, Inc.....195
Comtor Co. 195
Continental Tool Works,
Div. Ex-Cell-O Corp.....150
Cook, Inc., Lawrence H.....140
Cooper Weymouth, Inc.....186
Cosa Corp. 136
Covel Mfg. Co.....34, 41
Crucible Steel Co. of America..... 11
Cullen Mfg. Co.....177

Dayton Rogers Mfg. Co.....140, 147, 185
Dearborn Gage Co..... 40
Detroit Die Set Corp..... 9
Detroit Power Screwdriver..... 26
DeVlieg Machine Co..... 43
DoAll Co., The.....121
Dow Chemical Co., The..... 17
Drillmation Co. 164
Dumore Co., The..... 59
Dykem Co., The.....198

Eastern Machine Screw Corp.....177
Eastman Kodak Co..... 5
Eclipse Counterbore Co.....146
Eisler Engineering Co., Inc.....198
Elgin National Watch Co..... 61
Enco Mfg. Co.....170
Engis Equipment Co.....142
Enterprise Machine Parts Co.....182
Erickson Tool Co..... 68
Ex-Cell-o Corp.,
Continental Tool Works Div.....150

Falcon Tool Co..... 99
Felters Co., The.....151
Fenn Mfg. Co.....131
Flick-Reedy Corp.,
Miller Fluid Power Div..... 51

Gaertner Scientific Corp., The.....164
Gage Co. 138
Genesee Mfg. Co.....173
Glover Mfg. Co.....169

Gorton Machine Co., George..... 49
Graphic Systems 148
Greist Mfg. Co., The.....175

Hamilton Tool Co., The.....10, 139, 141
Hanchett Magna-Lock Corp.....118
Hannifin Corp. 177
Hardinge Brothers, Inc..... 66
Harig Mfg. Corp..... 18
Hartford Special Machinery Co., The.....116
House Machines, Inc.....163
Heimann Mfg. Co.....140
Hevi Duty Electric Co.....176
High Standard Mfg. Co.....181
Hill Acme Co..... 98, 181
Hi-Shear Rivet Tool Co., The.....186
Horberg Gage Co., The.....127
Hovis Screwlock Co.....157
Huebner Publications, Inc.....126, 174
Humm Safety Equipment Co.....164
Hutchinson Co., William T..... 30
Hypneumat, Inc. 169

Ideal Industries, Inc.....152
Industrial Tectonics, Inc.....181
Ingersoll-Rand Co. 112, 113

Jergens Tool Specialty Co.....155
Jersey Mfg. Co.....147
Johnson Mfg. Corp.....145
Jones & Lamson Machine Co.....46, 187

Kearney & Trecker Corp.,
Special Machinery Div..... 24
Kenco Mfg. Co.....190
Kidde Precision Tool Corp.....164, 170

Lapeer Mfg. Co.....132
Lavallee & Ide, Inc..... 4
Lee Co., K. O.....140, 174
Lepel High Frequency Labs, Inc..... 16
Lindberg Engrg. Co.....103, 119
Littell Machine Co., F. J..... 70
Lodding, Inc. 180
Logansport Machine Co., Inc.....148
Lovejoy Tool Co., Inc.....181
Lucas-Milhaupt Engineering Co..... 25
L. W. Chuck Co.....156

Machine Products Corp..... 48
Maxwell Co., The.....123, 132
May-Fran Engineering, Inc.....133
Mayline Co. 143
Mead Specialties Co.....182
Melin Tool Co., Inc.....161
Metal Carbides Corp.....178
Metallurgical Products
Dept. of General Electric..... 6
Meyers Co., Inc., W. F.....155
Micrometrical Mfg. Co..... 56
Micro-Plane, Inc. 177
Miller Fluid Power Div.,
Flick-Reedy Corp. 51
Monroe Engrg. Products, Inc.....169
Moore Special Tool Co., Inc..... 55
Morris Co., The Robert E..... 64
Morrison Engrg. Co.....126, 128

National Acme Co., The..... 27
Neise, Karl A. 127, 148, 177
Nelco Tool Co., Inc..... 29
New Britain Machine Co.,
Gridley Machine Div..... 19
Nobur Mfg. Co.....185
Northwestern Tool & Engrg. Co..... 28
Numberall Stamp & Tool Co.....185

Ohio Knife Co., The..... 21
O'Neil-Irwin Mfg. Co.....153
Onsrud Machine Works, Inc.....191

Penn Engrg. & Mfg. Corp.....128
Pioneer Engrg. & Mfg. Co..... 22
Pivot Punch & Die Corp.....140
Portage Double-Quick Tool Co.....165
Porter Precision Products.....154
Potter & Johnston Co..... 31
Pratt & Whitney Co., Inc.....32, 33, 109, 111
Precise Products Corp.....190
Producto Machine Co.....148
Putnam Tool Co. 3

ADVERTISING REPRESENTATIVES

CHICAGO 1: Robert R. Pierson, 333 N. Michigan Ave., FRanklin 2-4811

CLEVELAND 18: Jerry J. Miller, 1975 Lee Rd., FAirmount 1-4040

DETROIT 2: R. F. Pickrell, Larry Pickrell, 318 Stephenson Bldg., TRinity 1-0790

NEW YORK: Philip N. Meade, 60 E. 42nd Street, Room 411, New York 17, N. Y., YUkon 6-7695

NEW ENGLAND: R. N. Jorgenson, P. O. Box 55, Granby, Conn. OLdfield 3-6759, OLdfield 3-6850

LOS ANGELES 32: M. D. Pugh, Donn Pugh, P. O. Box 32188, CApitol 2-8857

Rampe Mfg. Co. 126
Raymond Mfg. Co. 144
Reid Tool Supply Co. 170
Rice Pump & Machine Co. 160
Richard Brothers Punch Div., Allied Products Corp. 58
Richards Co., J. A. 170
Robbins Co., Omer E. 137
Ross Operating Valve Co. 102
Rotor Tool Co. 115
Royal Design & Mfg. Co., Inc. 163

Sales Service Machine Tool 171
Scherr Co., Inc., George 148, 186
Schmidt, Inc., Geo. T. 138
Sealol Corp. 178
Service Machine Co. 198
Shell Chemical Corp. 65
Shore Instrument & Mfg. Co., Inc. 198
Silber Products, Inc. 147
Small Lot Stamping Co. 156
Sopko & Sons Co., Wm. 173
South Bend Lathe Works 126
Spellman Co., R. L. 143
Sperry Products, Inc. 138, 173
Spitfire Tool Co. 152
Spring Specialty Co. 197
Standard Parts Co. 166
Standard Pressed Steel Co. 12
Standard Tool & Mfg. Co. 124
Stebar Co. 170
Stupakoff Div. of The Carborundum Co. 50
Superior Steel Products Corp. 54
Sutton Tool Co. 2
Syntron Co. 42

Taft-Peirce Mfg. Co., The 189
Tannewitz Works, The 147
Techno-Products Corp. 195
Teeter, C. B. 170
Thriftmaster Products Corp. 182
Tomco Products Co. 128
Trico Fuse Mfg. Co. 178
Turchan Follower Machine Co. 125
Twentieth Century Mfg. Co. 124

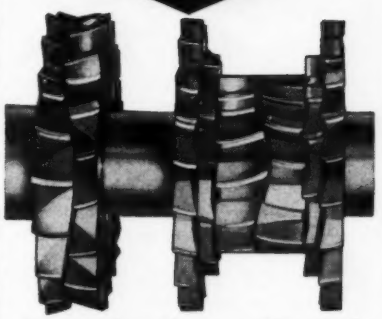
Uddeholm Co. of America, Inc. 96
United States Diamond Wheel Co. 140
Universal Engineering Co. 13

Vapor Blast Mfg. Co. 60
Verson Allsteel Press Co. 199
Vulcan Tool Co. 122, 144

Wales-Strippit Corp. 62
Walls Sales Corp. 169
Walton Co., The 185
Ward Machinery Co. 151
Wardwell Mfg. Co., The 127
Warner Development Co. 45
Warner & Swasey Co. 36
Watts Brothers Tool Works 170
Webber Gage Co. 179
Weldon Tool Co. 151
Wells Mfg. Corp. 132
Wesson Co. 37
West Point Mfg. Co. 57
Whistler & Sons, Inc., S. B. 143
Whitney Metal Tool Co. 132
Wisconsin Drill Head Co. 184
Wittek Mfg. Co. 198
Woodson Tool Co. 128
Woodworth, N. A. 156

Yoder Co., The 190
Yost Mfg. Co. 143

ABER
Curved Tooth
MULTIPLE CUTTERS



By using the wide range of Standard ABER CUTTERS for gang milling... fast accurate cuts on any number of surfaces simultaneously.

ABER Engineering service will design and make the unit exactly suited to your job . . . send blueprints and specify material to be cut.

ABER Curved Tooth PLUS FEATURES

1. Longer production runs
2. More accurate control of limits and finish
3. Elimination of chatter
4. Faster heat dissipation
5. Shearing action

FREE DATA — 24 page catalog on milling with ABER Cutters.

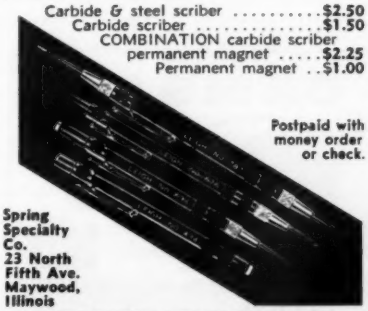
ABER ENGINEERING WORKS
WATERFORD WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1971

LEIGH POCKET TOOLS

Approx. 1/2" length of carbide. RESHARPEN points. Reverse for PERSONAL SAFETY.

Carbide & steel scriber $2.50
Carbide scriber $1.50
COMBINATION carbide scriber permanent magnet $2.25
Permanent magnet $1.00



Postpaid with money order or check.

Spring Specialty Co.
23 North Fifth Ave.
Maywood, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1972

ESTABLISHED 1916

ARROW END MILLS

A COMPLETE LINE OF END MILLS

Since 1916 Arrow has been a major supplier of End Mills — one of the oldest because Arrow has always been one of the best.

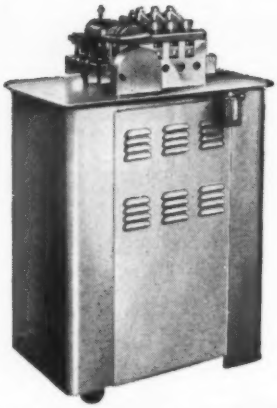
The Arrow line consists of all type of End Mills plus H. S. Steel and Carbide Tipped Specials.

ARROW TOOL & REAMER CO.
711 Stephenson Highway
P. O. Box 338 • Troy, Michigan

CALL YOUR ARROW DISTRIBUTOR

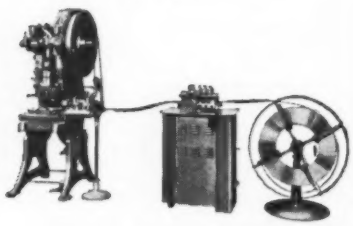
CIRCLE INFORM-A-GRAM KEY NO. 1973

FLEXIBILITY
in Stock Straightening



WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes—Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

Write for full particulars

WITTEK Manufacturing Co.

Production Feeding Equipment

4323 W. 24th Place • Chicago 23, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1931

You Can Rely on a **ROUSSELLE**

THESE 40-TON PRESSES take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are *very moderately priced.*

Manufacturers of Rousselle Presses

Significant savings may result if you let our engineering staff assist you. There is no obligation.

•

Rousselle Presses are sold exclusively through leading machinery dealers.

•

Choice of 25 models in 5 to 40-ton sizes.

SERVICE MACHINE CO. 2310 West 78th Street • Chicago 20, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1982

NEW YORK PLANT

REPUBLIC
TWIST DRILLS — REAMERS

Whether it is for No. 40 holes in Titanium sheets for Jets or 1 3/16" holes in thick armor plate, Republic Drills give more holes per drill and more holes per hour of direct labor.

REPUBLIC DRILL & TOOL CO.
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.

MAKERS OF "CELFOR," "CENTURY," "REPUBLIC" AND "U.S. EAGLE" BRAND TOOLS

100 LAFAYETTE ST., NEW YORK 13, N. Y. 3 PLANTS — NEW YORK — CHICAGO — LOS ANGELES

CIRCLE INFORM-A-GRAM KEY NO. 1983

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1984

CAMS ALL TYPES MADE TO YOUR SPECS

Mfrs' agents wanted

Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.

EISLER ENGINEERING CO., INC.
737 SO. 13TH ST. NEWARK 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1985

HARDNESS TESTING

has been done with the **SCLEROSCOPE**
Since 1907

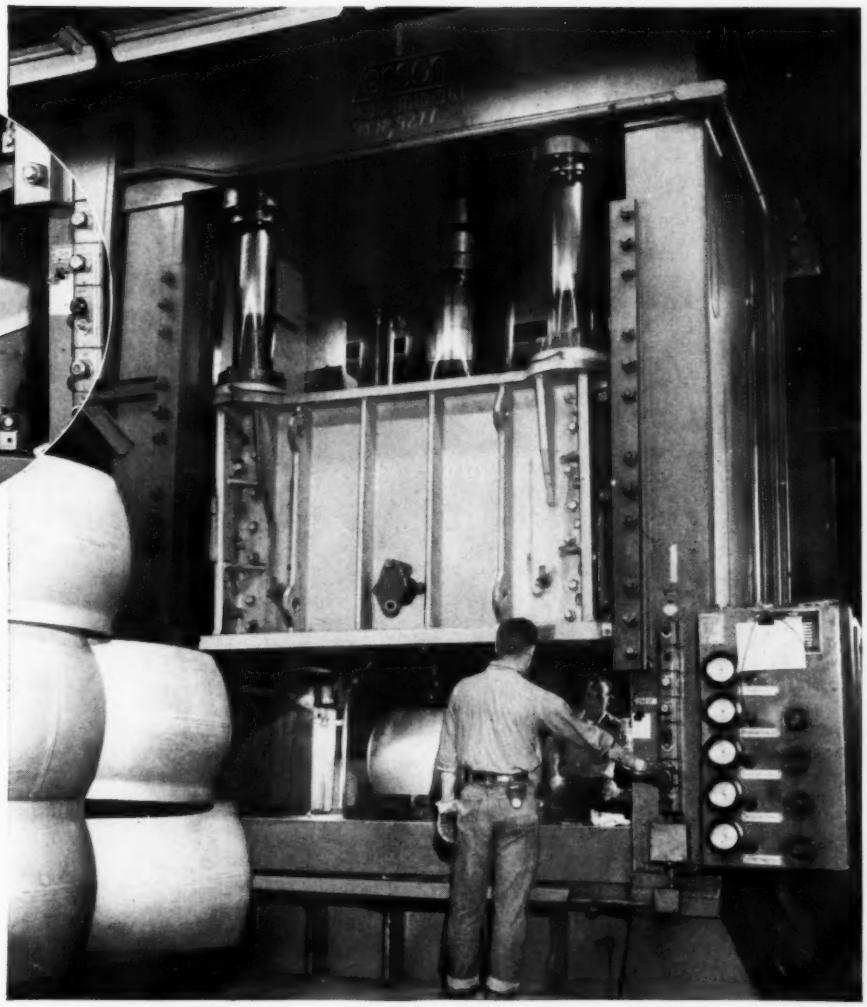
•

THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1986

Close-up of die space shows special expander die used in forming metal to smoothly rounded shape.

Nozzle support for J57 after burner is formed on Verson 1000 ton double action hydraulic press at Solar-Des Moines.



Another TRADE Verson MARK Press proves its versatility

. . . forming jet engine components at Solar Aircraft Company

This is Verson versatility at work . . . a 1000 ton Verson double action hydraulic press . . . "workhorse" at Solar Aircraft Company's Des Moines plant.

Solar produces components for jet and turbo-jet engines which power a number of our best known aircraft. They are also engaged in the manufacture of components for guided missiles. To this end, a variety of tasks are assigned to this Verson Press, including heavy duty expanding, sheet metal embossing and deep drawing. Forming is done primarily with 300 series or 410 stainless steels, ranging in thickness from .031 to .093.

The double action press, largest of its type at Solar-Des Moines, has proved a rugged and versatile production tool. In addition to the heavy jobs, it handles general production when needed.

Big job . . . small job . . . there's a Verson press for you. For specific recommendations send an outline of your requirements.

A Verson Press for every job from 60 tons up.

TRADE Verson MARK

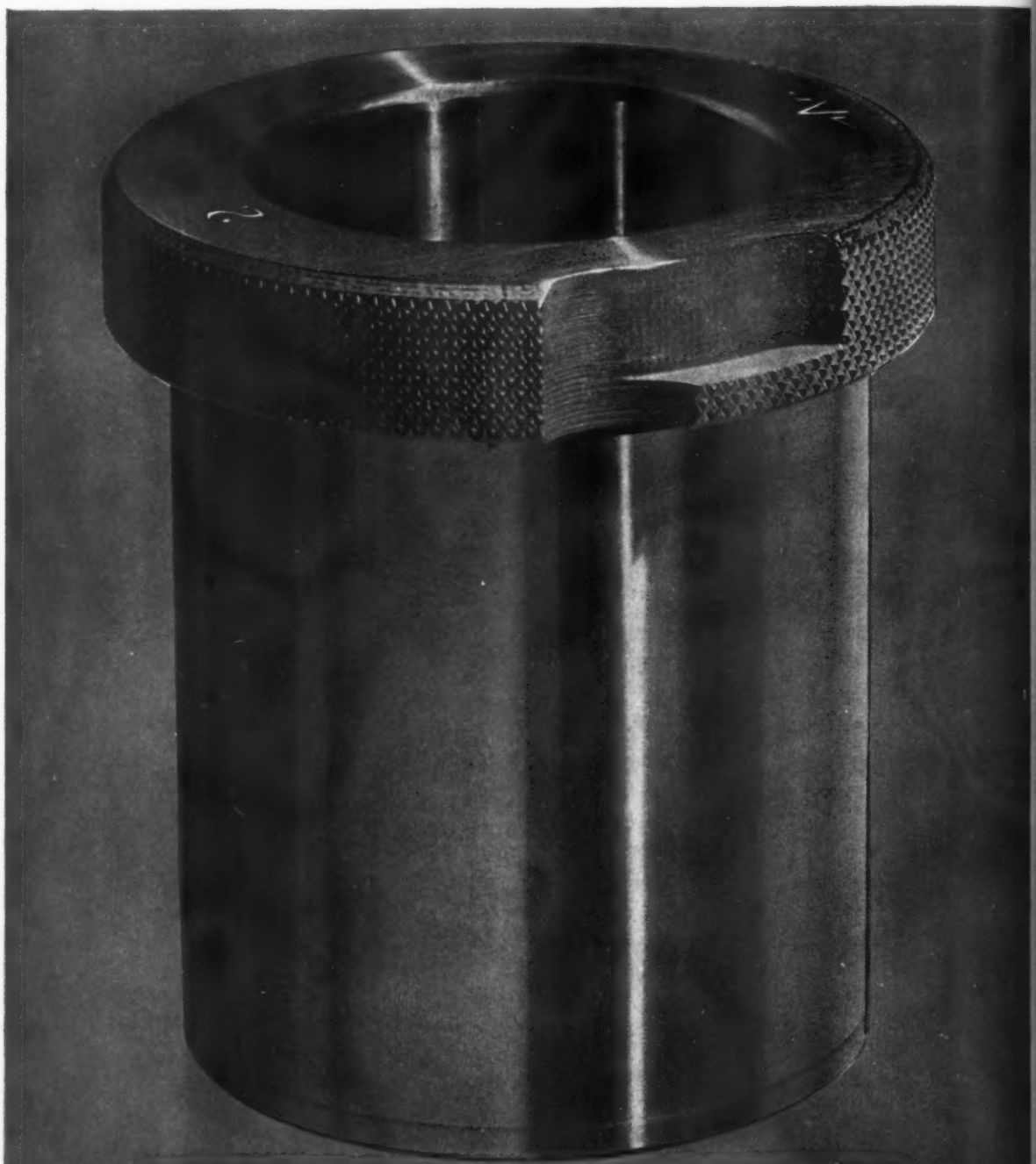
ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9335 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • 8300 S. CENTRAL EXPRESSWAY, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

HUEBNER PUBLICATIONS, INC.
1975 Lee Rd., Cleveland 18, O.



OF COURSE . . . IT'S *American!*